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(DIRECTOR : A. EIG)

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NOUVELLE CONTRIBUTION A L'ETUDE DE
LA MYCOFLORE DE PALESTINE

(Deuxième partie)

PAR T. RAYSS

(Avec figures 8, 9, 10 dans le texte)

Dans le "Palestine Journal of Botany", J Series, 1:143-160 a paru la première partie de ce travail comprenant les Myxomycètes, les Archimycètes et les Phycomycètes parasites récoltés par nous en Palestine. Cette deuxième partie est consacrée aux Ascomycètes.

Au cours de nos excursions nous avons récolté un matériel très riche de divers Ascomycètes, en particulier des Erysiphacées et des Pyrenomycètes. Une petite partie de ce matériel a été travaillée par nous jusqu'à présent et fait part de la présente contribution. De notre étude sur les Erysiphacées nous avons exclu pour le moment toutes les plantes que nous avons récoltées sous forme conidienne et dont la forme parfaite ne nous est pas connue de Palestine. Nous avons fait exception pour les espèces qui sont connues ailleurs aussi seulement sous forme d'*Oidium*, de même que pour *Oidium Matthiolae* qui mérite à notre avis une attention particulière et dont nous avons fait provisoirement une nouvelle espèce. Nous avons fait également exception pour toutes les Erysiphacées de notre collection qui ont les conidies du type *Oidiopsis* de forme et des dimensions bien caractéristiques et présentent une adaptation aux conditions xérophytiques par leur vie endophyte: nous les avons rangées dans l'espèce collective, *Leveillula taurica* (Lév.) Arnaud. Cette espèce, caractéristique des steppes arides de l'Asie Centrale et Occidentale de même que des steppes de la région pontique, se trouve en Palestine sur un grand nombre de plantes appartenant à des familles différentes. On pourrait sans doute en séparer un cer-

tain nombre de formes physiologiques et peut être même morphologiques en pratiquant des infections croisées d'une part et d'autre part en comparant les courbes d'un grand nombre de conidies prises sur chaque plante hospitalière séparément. Nous avons commencé à travailler dans cette voie et les résultats de cette étude seront publiés ultérieurement.

Pour les *Pyrenomycètes* nous ne donnons ici que quelques espèces dont la détermination nous a été possible, en nous réservant le droit de revenir sur ce groupe après l'avoir travaillé dans un grand laboratoire mycologique possédant la littérature nécessaire et les matériaux de comparaison. Il en est de même pour les *Discomycètes*.

Plusieurs plantes hospitalières paraissent être nouvelles pour les champignons récoltés par nous. Nous l'avons indiqué pour toutes les plantes dont la dispersion géographique est limitée à la Palestine et aux pays strictement avoisinants et pour lesquelles nous croyons avoir presque toute la littérature mycologique. Nous avons mis : "Plante hospitalière nouvelle ?" avec un point d'interrogation pour les plantes à distribution géographique plus large, lesquelles ne sont pas indiquées comme hôtes de champignons correspondants ni dans l'"Enumeratio plantarum" d'OUDEMANS, ni dans les monographies que nous avons sous main, ni dans notre cartothèque privée qui comporte les données d'une centaine de publications, en particulier de la région méditerranéenne et du Proche Orient.

Comme dans la première partie de ce travail, nous faisons précéder le nom de chaque espèce par deux nombres d'ordre : le chiffre en parenthèse indique un nouveau numéro d'ordre pour les espèces que nous indiquons ici pour la première fois ; ou bien c'est le chiffre (I) qui se rapporte à la publication suivante : SAVULESCU TR. et RAYSS T. (1935) : Contribution à l'Étude de la Mycoflore de Palestine. *Ann. Cryptog. exot.* 8 : 49-87.

PARTIE SPECIALE II.

ASCOMYCETES

Fam. *ERYSIPHACEAE*

46 (I). *Erysiphe cichoracearum* DC. em. Salm.

Sur les feuilles de *Carduus pycnocephalus* Jacq. : Haifa-Carmel, 28.IV.1938.

Conidies : $27-32 \times 11-19 \mu$; périthèces jeunes : $70-92 \mu$. Notre champignon se rapporte probablement à la forme spécifique *cardui* Blu-

mer établie par BLUMER (1933 p. 259) pour les formes de cette Erysiphacée parasitant en Europe les espèces de *Carduus*. Dans les expériences de BLUMER que nous nous proposons de répéter en Palestine, les conidies d'*Erysiphe cichoracearum* prises sur d'autres Composées ne produisent pas d'infection sur les espèces de *Carduus*.

Sur les feuilles de *Cichorium pumilum* Jacq. : Kiryat-Anavim, 10.V.1938.

Périthèces : 120-140 μ ; asques : 60-70 μ ; ascospores : 23-24 \times 12-18 μ ; conidies : 20-28 \times 12-16 μ . Notre plante appartient probablement à la forme spécifique *cichorii* Blumer établie pour les formes de ce champignon sur *Cichorium Intybus* et *C. Endivia*.

Sur les feuilles de *Crepis aspera* L. : Jérusalem, 17.V.1940 ; Motsa, 18.IV.1939 ; Pardess-Hana, 3.IV.1939, leg. S. Duvdevani ; Herzlia, 6.IV.1939, leg. M. Futurian.

Périthèces : 92-140 μ ; asques : 50-70 \times 16-22 μ , encore jeunes dans la plupart de nos échantillons ; ascospores : 18-28 \times 16-18 μ ; conidies : 21-35 \times 14-18 μ . Les conidies des exemplaires provenant de Pardess-Hana sont fortement attaquées par *Cicinnobolus Cesati* De Bary.

Sur les feuilles et les tiges de *Filago germanica* L. : Jérusalem, 15.V.1939, leg. J. Stettner.

Périthèces : 125-175 μ ; asques : 50-70 \times 23-28 μ ; ascospores (deux par asque) : 24 \times 14 μ .

Sur les feuilles de *Lactuca Scariola* L. : Jérusalem, 15.V.1940 ; Kiryat-Anavim, 19.V.1937.

Périthèces : 130-140 μ ; asques : 55-67 \times 30-35 μ ; ascospores : 20-22 \times 15-17 μ ; conidies : 22-30 \times 12-18 μ .

Sur les feuilles de *Picris amalecitan* (Boiss.) Eig : Kfar Vitkin, 9.III.1940. Plante hospitalière nouvelle.

Périthèces : 150-160 \times 125-160 μ ; asques : 35-62 \times 25-35 μ , jeunes ; conidies : 27-30 \times 12-15 μ .

Sur les feuilles de *Picris Sprengeriana* (L.) Lam. : Kiryat-Anavim, 28.IV.1939. Plante hospitalière nouvelle ?

Périthèces : 140-150 μ ; asques jeunes : 35-46 \times 25-29 μ ; conidies : 23-26 μ .

Sur les feuilles de *Rhagadiolus stellatus* DC. : Jérusalem, 24.III.1937 ; Haifa-Carmel, 23.III.1936 ; Tibériade, 18.III.1938. Plante hospitalière nouvelle ?

Périthèces : 125-145 μ , portant de nombreux fulcres tordus, brunâtres ; asques : 44-70 \times 21-30 μ ; ascospores (deux par asque) : 26-27 \times 11-13 μ ; conidies : 23-37 \times 12-16 μ , elliptiques-cylindriques, en chaînettes. Mycélium assez bien développé.

La seule Erysiphacée qui ait été citée sur cette plante hospitalière est *Sphaerotheca fulginea* Pollacci f. *rhagadiolidis* Jacz. indiqué par JACZEWSKI (1927, p. 93) en Dalmatie.

Sur les feuilles de *Sonchus oleraceus* L. : Motsa, 18.II.1938 ; Haifa-Carmel, 28.III.1936.

Périthèces : 115-140 μ ; asques : 50-60 \times 25-27 μ ; ascospores (deux par asque) : 23 \times 16 μ ; conidies : 25-35 \times 11-16 μ .

Correspond très probablement à la forme spécifique *sonchi* Blumer établie par cet auteur pour les *Erysiphe cichoracearum* parasitant diverses espèces de *Sonchus* (*Sonchus oleraceus* y compris).

Sur les feuilles d'*Urospermum picroides* (L.) Schmidt : Jérusalem, 17.V.1940 ; Kiryat-Anavim, 19.V.1938 ; Rosh-Pina, 29.IV.1937. Plante hospitalière nouvelle ?

Périthèces : 100-170 μ , munis de fulcres nombreux et longs ; asques : 50-70 \times 25-30 μ ; ascospores (deux par asque) : 20-23 \times 11-14 μ ; conidies : 29-32 \times 11-18 μ , en chaînettes.

La seule Erysiphacée connue sur cette plante hospitalière est *Sphaerotheca fuliginea* Polacci f. *urospermi* Jacz., citée de Dalmatie par JACZEWSKI (1927, p. 95). Notre champignon correspond par tous ses caractères à la diagnose d'*Erysiphe cichoracearum* DC. sensu Blumer, à une seule exception près : ses périthèces peuvent atteindre des dimensions qui dépassent les valeurs données par la diagnose (90-135 μ). Les dimensions des périthèces varient du reste beaucoup dans cette espèce.

47 (I). *Erysiphe communis* (Wallr.) Link

Sur les feuilles et les tiges d'*Erucaria myagroides* (L.) Hal. : Hanita, 10.XII.1939. Plante hospitalière nouvelle ?

Périthèces : 105-120 μ ; asques : 48-58 \times 27-35 μ , 3-8 par périthèce ; ascospores : 18-20 \times 13-15 μ , 4-6 par asque. Conidies : 35-38 \times 13-15 μ .

Sur les feuilles de *Lepidium sativum* L. cultivé : Silwan près Jérusalem, 19.VI.1935.

Conidies : 34-36 \times 16-18 μ . Indiqué sur *Lepidium sativum* en Russie (JACZEWSKI, 1927) et sur d'autres espèces de *Lepidium* un peu partout en Europe. Les cultures de Silwan souffrent beaucoup de cette maladie : toutes les plantes sont rabougries et presque meconnaissables.

Sur les feuilles de *Veronica Cymbalaria* Bod. : Rosh-Pina, 29.IV.1937. Plante hospitalière nouvelle ?

Périthèces : 110-115 μ ; asques : 53-60 \times 37-40 μ ; ascospores : 16-22 \times 9-14 μ (six par asque).

Plusieurs Erysiphacées ont été indiquées sur les espèces variées de *Veronica* : *Oidium erysiphoides* Fr., *Oidium* sp., *Sphaerotheca fuliginea* (Schlecht.) Salm., *Sphaerotheca macularis* (Wallr.) Jacz. ; *Erysiphe cichoracearum* DC. et enfin *Erysiphe communis* (Wallr.) Link f. *veronicae* Jacz., ce dernier champignon-sur *Veronica Teucrium* en Europe Occidentale. Par tous ses caractères notre champignon correspond à cette dernière espèce.

48 (192). *Erysiphe galeopsidis* DC.

Sur les feuilles de *Ballota saxatilis* Sieb. : Jérusalem, 10.IV.1937 ; Rosh-Pina, 29.IV.1937.

Périthèces : 120-170 μ ; asques : 50-52 \times 10-27 μ , stériles ; conidies : 21-34 \times 12-16 μ .

Sur les feuilles de *Lamium moschatum* L. : Bath-Shlomo, 12.III.1940. Leg. H. Blumenfeld. Plante hospitalière nouvelle ?

Périthèces : 130-145 \times 120-130 μ ; asques : 50-63 \times 23-26 μ , stériles ; conidies : 27-30 \times 13-16 μ .

49 (I). *Erysiphe graminis* DC.

Sur les feuilles d'*Aegilops sharonensis* Eig : Kfar-Vitkin, 8.IV.1939. Plante hospitalière nouvelle.

Périthèces : 140-225 μ ; asques : 62-75 \times 28-37 μ , stériles.

Sur les feuilles d'*Avena sterilis* DC. : Jérusalem, 10.IV.1937 ; Kiryat-Anavim, 19.V.1938.

Périthèces : 175-225 μ ; asques : 51-64 \times 25-36 μ , stériles.

Sur les feuilles de *Bromus madritensis* L. : Jérusalem, 9.V.1940. Leg. H. Habelska.

Périthèces : 180-200 μ ; asques : 55-65 \times 27-30 μ , stériles.

Sur les feuilles de *Bromus tectorum* L. : Beth-Hakerem, 30.III.1939.

Conidies : 26-37 \times 11-16 μ .

Sur les feuilles de *Bromus sterilis* L. : Motsa, 23.IV.1937 ; Rosh Pina, 29.IV.1937.

Conidies : 23-34 \times 10-13 μ .

Sur les feuilles de *Koeleria phleoides* Pers. : Rosh-Pina, 29.IV.1937.

Conidies : 25-28 \times 9-13 μ ; périthèces jeunes : 103-105 μ .

Sur les feuilles de *Phalaris minor* Retz :

Conidies : 23-28 \times 11-14 μ ; périthèces jeunes : 175-200 μ .

Sur les feuilles de *Scleropoa rigida* (L.) Gris. : Motsa, 23.VI.1938.

Périthèces : 200-230 μ ; asques : 68-70 \times 30-32 μ , stériles.

50 (193). *Erysiphe lamprocarpa* (Wallr.) Duby

Sur les feuilles de *Plantago cretica* L. : Jérusalem, 10.V.1939 ; Haifa-Carmél, 2.IV.1936 ; Tibériade, 18.III.1938. Plante hospitalière nouvelle ?

Périthèces : 100-170 μ ; asques : 40-58 \times 20-32 μ ; ascospores :

13-21 \times 9-14 μ , (deux par asque); conidies : 24-34 \times 11-15 μ .

Sur les feuilles de *Plantago Psyllium* L. : Tibériade, 18.III.1938 ; Daphne, 19.III.1940 ; Motsa, 18.III.1939.

Périthèces jeunes : 100-115 μ ; conidies : 27-32 \times 12-14 μ . A été indiqué sur cette plante en Alger en 1851 par LEVEILLE, en Espagne par UNAMUNO (1930) et dernièrement au Maroc par MAIRE et WERNER (1938, p. 18 : sub. *E. compositarum* Duby).

L'espèce *E. lamprocarpa* a été séparée par DUBY en 1830 pour les formes d'*E. cichoracearum* parasitant les *Plantago* et les *Galeopsis*. BLUMER maintient cette espèce seulement pour les formes sur *Plantago* et observe (1933, p. 277) : "Nach meiner Ansicht unterscheidet sich *E. lamprocarpa* auf *Plantago* durch die viel zahlreichern und kuerzern Anhaengsel, sowie durch die langen und schmalen Konidien deutlich von den meisten Formen der *Erysiphe cichoracearum*". Nos champignons correspondent par tous leurs caractères à la diagnose et à la remarque de BLUMER, mais les périthèces sur *Plantago cretica* sont plus grands que ne l'indique la diagnose (99-121 μ); ces valeurs rentrent toutefois dans celles de l'espèce collective, *E. cichoracearum*.

51 (194). *Erysiphe Martii* Lév. s. str.

Sur les feuilles, les tiges et les sépales d'*Onobrychis Crista galli* (L.) Lam. : Jérusalem, 14.V.1936 ; Kiryat-Anavim, 6.V.1936.

Périthèces : 110-125 μ , munis de fulcres presque hyalins, plus ou moins droits et présentant souvent au sommet une ramification dichotomique; asques : 40-50 μ ; ascospores : 16-25 μ (six par asque). Ce champignon a été signalé en Palestine sur cette même plante hôte, par P. MAGNUS (1900).

Sur les feuilles d'*Onobrychis squarrosa* Viv. : Beth-Hakerem, 14.IV.1939; Motsa, 8.IV.1939; Kiryat-Anavim, 28.IV.1939; Rehovot, 9.IV.1938; Herzlia, 7.IV.1939; Kfar Vitkin, 7.IV.1939; Nathania, 10.IV.1939; Kfar Eliashev, 8.IV.1939. Plante hôte nouvelle.

Périthèces : 95-120 μ ; asques : 50-64 \times 30-35 μ ; ascospores : 16-25 \times 10-13 μ , 3-4 par asque.

52 (195). *Erysiphe pisi* DC.

Sur les tiges, les feuilles et les vrilles de *Pisum sativum* L. : Beth-Hakerem, 25.V.1935, leg. Z. Avizohar.

Conidies : 27-37 \times 14-18 μ .

Les cultures de pois à Beth-Hakerem ont été fortement endommagées par ce champignon.

53 (I). *Erysiphe polygoni* DC.

Sur les tiges et les feuilles de *Polygonum aviculare* L. : Jérusalem, 5.VI.1935. Conidies : 32-39 \times 11-16 μ .

Sur les tiges et les feuilles de *Polygonum Bellardi* All. : Royat (Kurdistan d'Irak), 5.X.1933. Leg. A. Eig et M. Zohary.

Périthèces : 93-138 μ ; asques : 46-60 \times 34-42 μ ; ascospores : 23-25 \times 12-13 μ ; conidies : 25-40 \times 11-14 μ .

Sur les feuilles de *Polygonum serrulatum* Lag. : Kurdani, 17.IX.1939. Leg. H. Habelska. Plante hôte nouvelle ?

Conidies : 30-39 \times 12-17 μ ; périthèces, encore jeunes : 105-130 μ .

54 (I). *Erysiphe umbelliferarum* De Bary

Sur les feuilles de *Caucalis leptophylla* L. : Haifa-Carmel, 28.III.1936.

Conidies : 27-37 \times 11-16 μ .

Sur les feuilles de *Scandix pecten Veneris* L. : Mont Carmel, 20.III.1940.

Périthèces : 112-140 \times 85-100 μ ; asques : 57-62 \times 37-40 μ ; ascospores : 20-25 \times 12-15 μ ; conidies : 30-35 \times 10-15 μ .

Notre champignon a des conidies cylindriques et des périthèces aplatis comme l'indique la diagnose; mais nos périthèces sont plus grands (dans la diagnose : ca. 90-115 μ). Ceci est d'autant plus intéressant que, d'après BLUMER (p. 200), les dimensions des périthèces chez *Erysiphe umbelliferarum* varient peu avec la plante hôte. Les dimensions typiques des périthèces, d'après BLUMER, sont :

Pour la forme sur <i>Heracleum</i>	92-104 μ
" <i>Angelica silvestris</i>	93-111 μ
" <i>Chaerophyllum</i>	95-115 μ
" <i>Pimpinella</i>	95-115 μ
" <i>Chaerifolium silvestre</i>	97-113 μ
et, en comparaison avec elles, sur <i>Scandix pecten Veneris</i>	112-140 μ .

Sur les feuilles de *Torilis nodosa* (L.) Gaertn. : Haifa-Carmel, 29.III.1936 ; Rosh-Pina, 21.IV.1937.

Périthèces : 110-140 μ , aux fulcres souvent ramifiés ; asques : 70 \times 30 μ ; ascospores : 18-20 \times 11-14 μ (5 par asque) ; conidies : 25-32 \times 9-14 μ .

55 (I). *Leveillula taurica* (Lév.) Arnaud

Sur les tiges, les feuilles et les épines d'*Alhagi maurorum* Medic. : Jérusalem, 14.X.1935 ; Naharia, 10.XII.1939.

Périthèces : 200-230 μ ; asques : 76-90 \times 34-50 μ ; ascospores : 30-37 \times 16-18 μ ; conidies : 44-55 \times 14-19 μ .

Sur les feuilles d'*Althaea acaulis* Cav. : Jérusalem, 1.XI.1936. Leg. D. Jar-deni. Plante hospitalière nouvelle.

Conidies : 44-55 \times 14-19 μ .

Sur les feuilles d'*Althaea rosea* Cav. : Jérusalem, 15.XI.1938 (indiqué sur cette plante hospitalière à Chypre (NATTRASS, 1937).

Conidies : 53-64 \times 14-20 μ .

Sur les bractées florales de *Centaurea hyalolepis* Boiss. : Rosh-Pina, 10.VI.1937. Plante hospitalière nouvelle ?

Conidies : 41-46 \times 14-18 μ .

Sur les feuilles de *Cistus salviaefolius* L. : Jérusalem, jardin Botanique, 2.XII.1936. (Syn. : *Ovulariopsis Cisti* Jaap).

Conidies : 45-50 \times 14-20 μ .

Sur les feuilles de *Crotophora tinctoria* (L.) A. Juss. : Mikveh-Israel, 12.X.1934. Plante hospitalière nouvelle ?

Conidies : 42-58 \times 12-20 μ .

Sur les tiges de *Foeniculum piperitum* Presl. : Jérusalem, 14.X.1935 ; Mish-mar Haemek, 19.X.1939. Plante hospitalière nouvelle ?

Périthèces : 150-250 μ ; asques : 60-80 \times 18-37 μ ; ascospores : 23-36 \times 16-18 μ . Forme des manchons caractéristiques autour des tiges.

JACZEWSKI (1927, p. 419) fait une forme *foeniculi* pour le champignon qui se développe en Algérie sur les tiges de *Foeniculum vulgare* Mill. et indique pour cette forme la dimension des asques : 36-38 \times 15 μ . Nos asques sont notablement plus grandes et correspondent davantage aux dimensions typiques.

Sur les feuilles de *Gaillardia* cult. : Jérusalem, 20.V.1937. Plante hospitalière nouvelle ?

Conidies : 46-55 \times 14-16 μ .

Sur *Gaillardia aristata* Pursch. ont été indiquées en Amérique deux Erysiphacées : *Erysiphe cichoracearum* et *Sphaerotheca fuliginea*. Notre champignon a des conidies du type *Oidiopsis* sortant par les stomates et présentant des dimensions caractéristiques du genre *Leveillula*.

Sur les feuilles d'*Haplophyllum Buxbaumii* (Poir.) Boiss. : Zichron Ja'akob, 9.X.1937. Syn. : *Oidium Haplophylli* Magn., décrit par P. MAGNUS (1910) sur cette même plante hospitalière à Jaffa.

Conidies : 46-62 \times 11-16 μ .

Sur les tiges et les feuilles d'*Onopordon palaestinum* Eig : Jérusalem, 23.XI.39. Plante hospitalière nouvelle.

Périthèces : 200-212 \times 160-180 μ ; asques jeunes : 42 \times 25 μ .

Sur les feuilles de *Parietaria judaica* L.: Jérusalem, 22.XII. 1937; Rosh-Pina, 10.VI.1937. Plante hospitalière nouvelle.

Conidies : $45-60 \times 12-18 \mu$.

Sur les espèces de *Parietaria* est indiqué en Amérique *Erysiphe cichoracearum* DC. f. *parietariae* Jacz.

Sur les feuilles de *Phlomis brevilabris* Ehrenb.: Liban, "Mon Repos", 18.V.1935. Leg. M. Evenari. Plante hospitalière nouvelle.

Périthèces : $225-275 \mu$; asques : $62-70 \times 20-40 \mu$; ascospores : $27-30 \times 14-22 \mu$.

Sur les feuilles de *Rosmarinus officinalis* L.: Jérusalem, 15.IV. 1936.

Conidies : $40-46 \times 12-16 \mu$.

Ce champignon a déjà été indiqué sur cette plante hospitalière par Scornic en Croatie (apud BLUMER, p. 405).

Sur les feuilles de *Solanum Lycopersicum* L.: Beth-Hakerem, 15.VIII.1935, leg. Z. Avizohar; Talpioth, 20.VII.1939.

Conidies : $40-46 \times 12-14 \mu$.

Selon NATTRASS (1937, p. 5), *Leveillula taurica* parasitant les tomates à Chypre, a des conidies plus étroites que toutes les autres formes de ce champignon : leur diamètre est de 12 à 14μ . Nos mesures confirment cette constatation. Au Maroc, les tomates parasitées par ce même champignon, ne portent point de fruits (BERGER, 1928). Cette maladie peut donc devenir grave.

En Angleterre, Transcaucasie et Turkestan, est indiqué sur les tomates l'*Oidium Lycopersicum* Cooke et Massee (voir JACZEWSKI, 1927, p. 492). Mais ce champignon a des conidies disposées en chaînettes, arrondies et de 8 à 9μ de diamètre; tandis que le nôtre a une seule conidie terminale, allongée, du type *Oidiopsis*, de 12 à 14μ de diamètre et les conidiophores sortent par les stomates.

Sur les feuilles de *Solanum Melongena* L.: Talpioth, 28.XII.1937, leg. H. Habelska. Produit des dégâts notables dans les cultures.

Conidies : $39-60 \times 12-18 \mu$.

Ce champignon a été signalé dans les cultures des aubergines en Palestine encore en 1922 par REICHERT (1926); il a été indiqué sur cette même plante hospitalière aux Indes (BUTLER), Egypte (REICHERT), Syrie (REICHERT), Chypre (NATTRASS), Madagascar (BOURRIQUET), Maroc (BERGER).

Sur les tiges et les feuilles de *Spartium junceum* L.: Talpioth, 4.XII.1939; Jérusalem, 18.I.1940. Plante hospitalière nouvelle?

Conidies : $40-48 \times 15-18 \mu$. Les feuilles attaquées sont beaucoup plus grandes que les autres, ce qui donne à la plante un aspect bien particulier qu'on pourrait comparer à des balais de sorcière en miniature.

Sur cette même plante hospitalière a été indiqué en Dalmatie *Erysiphe contmunis* Grev. forma *spartii* Jacz. (JACZEWSKI, 1927, p. 263). Ce champignon, d'après JAAP, provoque la fasciation et la formation des balais de sorcière. Selon JACZEWSKI, ce pourrait être une espèce particulière mais malheureusement la description de JAAP est insuffisante. Notre champignon est un *Leveillula* ayant des conidiophores sortant par les stomates et les conidies du type *Oidiopsis*.

Une autre Erysiphacée a été indiquée dernièrement en Grèce sur le *Spartium*: *Microsphaera Baumleri* Magn. (SAREJANNI, 1935b, p. 71-74). Ce champignon détruit les jeunes rameaux, les boutons floraux et les feuilles encore tendres de cette plante en produisant ainsi des dégâts notables.

- Sur les feuilles et les parties florales de *Teucrium divaricatum* Sieb. var. *canescens*: Liban, au dessus d'Edhen, 3.IX.1931. Leg. A. Eig et M. Zohary.

Périthèces: 184-210 μ ; asques: 71-98 \times 46-50 μ ; ascospores: 25-35 \times 16-23 μ , deux par asque; conidies: 46-62 \times 14-16 μ .

- Sur les feuilles de *Teucrium divaricatum* Sieb.: (Syn.: *Ovulariopsis Teucii* Jaap). Jérusalem, 9.XII.1938. Leg. Z. Bumstein.

Conidies: 50-78 \times 11-18 μ .

- Sur les feuilles de *Teucrium creticum* L.: Jérusalem, 9.XII.1938. Leg. Z. Bumstein.

Conidies 50-62 \times 16-18 μ .

- Sur les feuilles de *Teucrium Polium* L., Jérusalem, 9.XII.1938. Leg. Z. Bumstein.

Conidies: 41-52 \times 16-18 μ .

Ces trois espèces de *Teucrium*, cultivées une à côté de l'autre au Jardin Botanique de l'Université Hébraïque, sont attaquées en même temps par le même champignon qui passe sans doute d'une plante à l'autre.

- Sur les feuilles de *Tropaeolum majus* L.: Jérusalem, 2.XII.1935; Beth-Hakerem, 1.VII.1936, leg. Z. Avizohar; Talpioth, 4.XII.1939.

Conidies: 48-60 \times 13-18 μ .

Le champignon se développe en petits îlots délimités par les nervures de la feuille. Par la suite la feuille jaunit et se fane. Dans certains jardins les *Tropaeolum* en sont gravement endommagés et ne fleurissent plus. Cette maladie est connue depuis 1934 à Palermo (CANONACO, 1937) et depuis 1936 au Maroc (BERGER, 1939). Il est curieux de voir que la maladie en question a apparu presque simultanément en Palestine, Sicile et Maroc.

En Portugal sur les feuilles de *Tropaeolum majus* a été indiqué par SOUSA da CAMARA et GOMES da LUZ (1939) l'*Oidium cynarae* Ferrar. et Massa. Cette espèce a été créée par FERRARIS et MASSA en 1912 pour le champignon qui attaque en Italie les feuilles de *Cynara Scolymus*; il ressemble par tous ses caractères à *Oidiopsis* (donc à *Leveillula*), à une exception près: son mycélium est superficiel et non interne, comme chez *Leveillula*. Mais le champignon que nous trouvons en Palestine sur toutes les feuilles attaquées de *Tropaeolum majus* correspond par tous ses caractères au genre *Leveillula*: mycélium interne, conidiophores sortant par les stomates, conidies de dimension et de forme caractéristiques. Il en est de même pour le champignon que nous trouvons en Palestine sur les feuilles de *Cynara Scolymus* (SAVULESCU et RAYSS, 1935, p. 62): c'est un *Leveillula* typique au mycélium interne.

- 56 (196). *Microsphaera alphitoides* Griffon et Maublanc Fig. 8.

Sur les jeunes feuilles de *Quercus calliprinos* Webb.: Elon, 9.XII.1939; Hanita, 10.XII.1939. Conidies et sur quelques feuilles des périthèces en grand nombre et de tous les âges. Plante hospitalière nouvelle.

Conidies : $25-35 \times 10-16 \mu$; périthèces : $110-150 \mu$, à cellules pariétales assez régulières, $18-28 \mu$ de diamètre (un peu plus grandes que ne l'indique la diagnose de BLUMER : $15-20 \mu$) ; 15 à 30 fulcres, trois-quatre fois dichotomiquement ramifiés, aussi longs ou un peu plus longs que les périthèces ; asques : $50-65 \times 37-40 \mu$; ascospores (huit par asque) : $20-27 \times 9-12 \mu$. Les périthèces de nos exemplaires dépassent souvent les dimensions typiques indiquées par la diagnose de BLUMER ($103-130 \mu$), mais d'après JACZEWSKI (1927, p. 329) les périthèces de cette espèce peuvent atteindre la grandeur exceptionnelle de 200μ .

Quercus calliprinos est l'élément le plus important constituant le maquis en Palestine et est très répandu dans ce pays. C'est pourtant pour la première fois que nous le voyons attaqué par l'*Oidium* du chêne. Dans les deux stations indiquées, les jeunes pousses sont presque entièrement recouvertes d'un enduit blanc épais. Toutefois le champignon ne paraît pas leur nuire beaucoup car les feuilles deviennent vite coriaces et se débarrassent du champignon.

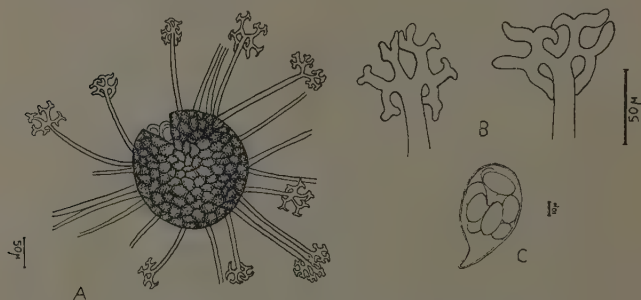


Fig. 8. *Microsphaera alphetoides* Griffon et Maublanc.

A. Périthèce, B. Fulcres. C. Asque et ascospores.

Ce même champignon, sous le nom d'*Oidium alphetoides* Griff. et Maubl., a été indiqué sur l'espèce de chêne la plus voisine de la nôtre, *Quercus coccifera* L., en Espagne (FRAGOSO, 1927), en Grèce (SAREJANNI, 1935a) et encore avant, dans les jeunes plantations de *Quercus coccifera*, en France (HARIOT, 1908).

Sur les feuilles de *Quercus infectoria* Oliv.: Elon, 9.XII.1939, conidies ; Horpesh près Safed, pépinière, I. 1940, conidies et périthèces.

Conidies : $25-28 \times 12-16 \mu$; périthèces : $112-125 \mu$; fulcres : $90-150 \mu$; asques encore jeunes.

Ce champignon a été déjà indiqué sur cette même plante hospitalière en Chypre par NATTRASS (1937) (sous le nom de *Microsphaera quercina* (Schwein.) Burr.).

57 (197). *Sphaerotheca erodii* (Jacz.) Rayss comb. nov. Fig. 9. Syn. *Sphaerotheca macularis* Magn. f. *erodii* Jaczewski, Karmannii Opre-ditel gribow, II. 67 (1927).

Sur les feuilles et les pétioles d'*Erodium moschatum* (L.) L'Her.: Pardess Hana, 15.IV.1940, leg. S. Duvdevani.

Mycélium aérien formé par des hyphes incolores portant ci et là des conidies en chaînettes (du type *Eu-Oidium*), déjà rares dans nos exemplaires; dimension des conidies: $20-25 \times 13-15 \mu$; mycélium secondaire formé rarement, le long des pétioles, brunâtre; périthèces en grande quantité, surtout sur la face inférieure des feuilles, $100-137 \mu$ de diamètre; leur paroi est formée par des cellules bien visibles quand le périthèce est encore jeune, $15-20 \mu$ de diamètre, mais ces cellules deviennent opaques et difficiles à distinguer quand le périthèce mûrit. Les fulcres sont plus ou moins nombreux, hyalins puis bruns, de longueur du périthèce ou tout au plus deux fois plus longs que lui. Asque plus ou moins arrondie, à paroi épaisse, $60-70 \times 55-60 \mu$, contenant huit spores. Ascospores arrondies, $13-15 \times 12-14 \mu$.

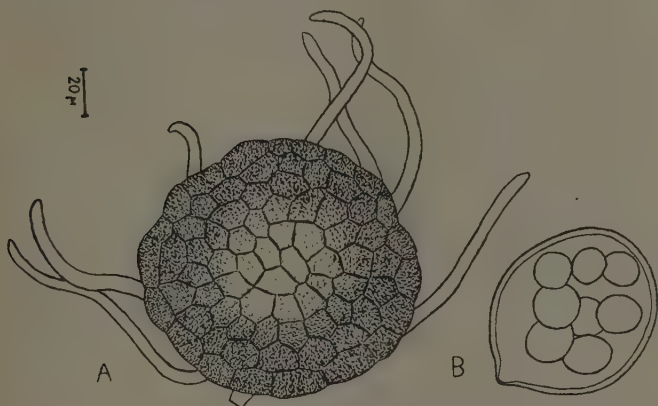


Fig. 9. *Sphaerotheca erodii* (Jacz.) Rayss
A. Périthèce. B. Asque et ascospores.

Sur les tiges, les pétioles et les feuilles d'*Erodium malacoides* (L.) Willd.: Jérusalem, 15.V.1940.

Conidies nombreuses, $17-25 \times 12-15 \mu$; mycélium secondaire ci et là, sur les tiges, rarement sur les feuilles; périthèces en petit nombre, encore jeunes, sur la tige ou sur les deux faces de la feuille, $78-100 \mu$ de diamètre; asque: $50 \times 47 \mu$; ascospores jeunes, $12-15 \times 10-13 \mu$.

L'espèce collective, *Sphaerotheca macularis* Magnus, a été considérée comme une espèce polyphage, pouvant attaquer des plantes hospitalières appartenant à des familles différentes. L'étude approfondie de cette espèce collective a permis d'y distinguer quelques espèces au sens plus strict de ce mot, différant l'une de l'autre par des caractères morphologiques et biologiques (voir la monographie de BLUMER). Actuellement le nom de *Sphaerotheca macularis* (Wallr.) Jacz. est réservé aux *Sphaerotheca* attaquant les Rosacées.

Sur les Géraniacées ont été décrites deux formes de l'espèce collective *Sph. macularis* : forma *geranii* Potebnia, élevée au rang d'espèce sous le nom de *Sphaerotheca fugax* Penzig et Sacc., parasitant sur différentes espèces de *Geranium* et à distribution géographique vaste et forma *erodii* Jaczewski, dont nous faisons l'espèce *Sphaerotheca erodii* (Jacz.) Rayss, parasitant les espèces d'*Erodium* (*E. Botrys*, *E. malacoides*, *E. moschatum*) en Alger, en Dalmatie et en Palestine. Notre champignon est voisin de *Sphaerotheca fugax*, mais en diffère par toute une série de caractères et ceci nous permet d'en faire une espèce séparée. Nos périthèces sont plus grands (chez *Sph. fugax* : $81-93 \mu$) et portent des fulcres plus courts (chez *Sph. fugax* les fulcres sont 1 à 4 fois plus longs que le périthèce). Nos asques ont la forme beaucoup plus arrondie et les spores sont plus rondes et plus petites ; les conidies sont également plus petites. Les différences portent ainsi sur tous les caractères de ces deux champignons.

58 (I). *Sphaerotheca pannosa* (Wallroth) Léveillé var. *persicae* Woron.

Sur les feuilles et les jeunes fruits de *Prunus persica* L. : Jérusalem ; 19.V.1940, leg. S. Tatarski.

Conidies : $17-25 \times 10-13 \mu$.

L'attaque produite par ce champignon sur les pêchers examinés par nous est très grave : les feuilles sont recoquevillées et se dessèchent rapidement ; les jeunes fruits présentent des taches arrondies, de un à deux centimètres, confluant parfois en des étendues plus grandes, de couleur blanc-rosâtre, nombreuses.

59 (I). *Sphaerotheca fuliginea* (Schlecht.) Salm.

Sur les feuilles et les bractées de *Scabiosa prolifera* L. : Alonim, 14.V.1939. Leg. I. Wahl.

Périthèces : $85-99 \mu$; asques : $56-64 \times 46-55 \mu$; ascospores (huit par asque) : $16-18 \times 10-16 \mu$.

60 (198). *Oidium abelmoschi* Thuem.

Sur les feuilles d'*Hibiscus esculentus* L. : Hedera, 9.XI.1935 ; Kfar Saba, 16.VII.1939, leg. I. Wahl.

Conidies : $23-28 \times 11-18 \mu$.

61 (199). *Oidium ceratoniae* Comes

Sur les feuilles de *Cerantonia Siliqua* L. : Jérusalem, 16.VI.1937, leg. D. Jar-deni ; Zichron Ja'acob, 9.X.1935.

Conidies : $30-34 \times 11-13 \mu$, pour la plupart isolées, du type *Pseudoidium*.

Maladie répandue en Italie, surtout en Italie Méridionale (FERRARIS, 1913) ; indiquée en Grèce (POLITIS, 1935), Chypre (NATTRASS, 1937), Maroc (MAIRE et WERNER, 1937) et dernièrement en Palestine par REICHERT (1933).

62 (200). *Oidium chrysanthemi* Rabenh.

Sur les feuilles de *Chrysanthemum indicum* L. cult. : Jérusalem, 17.XII.1936. Leg. I. Wahl.

Conidies : $34-42 \times 14-21 \mu$.

Cette maladie a été signalée en Allemagne, Italie, Portugal, Espagne et Suède (FRAGOSO, 1927).

63 (101). *Oidium dianthi* Jacz.

Sur les feuilles et les calices de *Dianthus caryophyllus* L. cult. : Jérusalem, 1.XII.1936, Talpioth, 4.XII.1939.

Conidies : $32-42 \times 12-18 \mu$.

Ce champignon est apparu en Russie, au Jardin Botanique d'Odessa en 1923 et en Angleterre en 1925 en produisant des dégâts considérables dans les cultures d'œuillets (voir JACZEWSKI, 1927, p. 461). En Palestine il est localisé dans certains jardins et les plantes attaquées en souffrent beaucoup.

64 (202). *Oidium erysiphoides* Fr.

Sur les feuilles d'*Ipomoea rubro-coerulea* Hook : Jérusalem, 5.XII.1936 ; Bnei-Brak, 14.XII.1938, leg. H. Habelska ; Naharia, 10.XII.1939.

Conidies : $28-38 \times 12-18 \mu$.

Ce champignon est indiqué en Espagne sur *Ipomoea coccinea* et *I. sagittata* (FRAGOSO, 1927, p. 43) et c'est la seule indication d'une Erysiphacée que nous trouvons dans la littérature sur les espèces d'*Ipomoea*. Les *Ipomoea* sont beaucoup cultivés en Palestine, pourtant nous n'avons trouvé cette maladie que trois fois : elle paraît être rare en Palestine comme ailleurs.

65 (203). *Oidium matthiolae* Rayss sp. nov. ad interim. Fig. 10.

Caespitulis arachnoideis, effusis, albis, amphigenis ; conidiophoris adscendentibus vel erectis, pauciseptatis ; conidiis ovoideis vel doliiiformibus, laevibus, $30-40 \times 12-16 \mu$, hyalinis, bi-tri-catenulatis, facillime secedentibus.

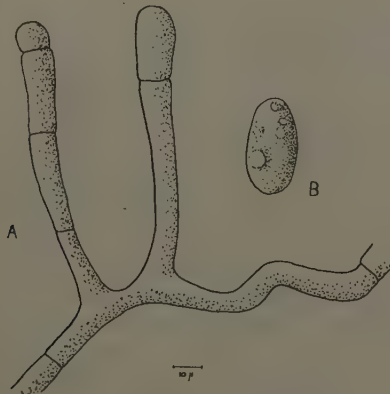


Fig. 10 *Oidium matthiolae* Rayss
A. Conidiophores. B. Conidie.

Habitat in foliis vivis *Matthiolae incanae* R. Br. cult. : Jérusalem, 12.VIII.1938 ; Beth-Hakerem, 27.V.1935, leg. Z. Avizohar ; Tel-Aviv, 29.IX.1935 ; Talpith, 4.XII.1939.

Dans la littérature que nous a été accessible, nous n'avons trouvé aucune indication d'Erysiphacée sur cette plante, cultivée pourtant sur une grande échelle dans des pays différents. En Palestine, l'*Oidium matthiolae* se trouve assez souvent, mais ne produit pas de dégâts notables. Il est possible que notre champignon n'est que le stade conidien d'*Erysiphe communis* qui est fréquent sur les Crucifères, possède des conidies des dimensions variables (celles sur *Brassica Rapa* par exemple correspondent aux nôtres) et forme très rarement des périthèces sur certaines plantes hospitalières. Aussi en avons nous fait une espèce nouvelle provisoirement. Nous n'avons pas rapporté notre champignon à l'*Oidium erysiphoides* auquel il ressemble par ses grandes conidies parce que notre champignon paraît être lié à sa plante hospitalière et n'est pas polyphage comme l'*Oidium erysiphoides*. Les expériences sur cette question sont actuellement en train.

66 (204). *Oidium verbenae* Thuem. et Bolle

Sur les feuilles de *Verbena* sp. cult. : Beth-Hakerem, 27.III.1937 ; Giv'ath Brenner, 24.VI.1939.

Conidies : $23-28 \times 11-14 \mu$.

Fam. PERISPORIACEAE

67 (I). *Capnodium Footii* Berk. et Desm.

Sur les feuilles d'*Olea europaea* L., en particulier sur les poils étoilés de leur face inférieure : Jérusalem, 21.V.1936. Leg. R. Ben-Ami ; Beth Hakerem, 20.VII.1937.

Fam. DOTHIDEACEAE

68 (205). *Dothidella trifolii* Bayliss-Elliott

Syn. : *Phyllachora trifolii* Fuck. Forme conidienne : *Polythrincium trifolii* Kunze.

Sur les feuilles de *Trifolium clypeatum* L. : Kiryat-Anavim, 21.IV.1938 ; Haifa Carmel, 2.VI.1936. Mont Hettari près Zichron-Yacob, 12.III.1940 ; Yaaroht-Hakarmel, 13.III.1940 ; Kiryat Amal, 14.III.1940 ; Jagur, 14.III.1940 ; Hanita, 17.III.1940 ; Kfar Gileadi, 19.III.1940. Stade spermogonique. Plante hospitalière nouvelle.

Sur les feuilles de *Trifolium curvisepalum* V. Taekholm : Beth-Hakerem, 14.IV.1939 ; Motsa ; 18.IV.1939 ; Ramath-Gan, 15.II.1938. Stade conidien et spermogonique. Plante hospitalière nouvelle.

Sur les feuilles de *Trifolium dichroanthum* Boiss. : Nathania, 10.IV.1938. Stade conidien. Plante hospitalière nouvelle. Dans un champ entier de *Trifolium dichroanthum* nous avons trouvé avec peine un exemplaire faiblement attaqué tandis que le *Trifolium palaestinum* tout à côté a énormément souffert de ce même champignon.

- Sur les feuilles de *Trifolium Meneghinianum* Clem.: Wadi Paga au bord de Jourdain, 17.IV.1924. A été indiqué sur cette plante hospitalière en Mésopotamie par BUBAK (1914) sub *Phyllachora trifolii* (Pers.) Fuck.
- Sur les feuilles de *Trifolium nervulosum* Boiss. et Heldr.: Bnei-Brak, 9.III.1938; Agrobank, 8.IV.1938; Sarafand, 31.I.1936. Stade conidien et spermogonique. Plante hospitalière nouvelle.
- Sur les feuilles de *Trifolium palaestinum* Boiss.: Ramath-Gan, 7.IV.1928; Kfar Vitkin, 8.IV.1939; Avihail, 7.IV.1939; Giv'hat Brenner, 10.IV.1939. Indiqué sur cette plante hospitalière en Palestine par MAGNUS (1900): "in arenosis ad Jaffa". Dans toutes les localités où se trouve ce trèfle il est fortement attaqué par le champignon en question et perd bientôt toutes ses feuilles.
- Sur les feuilles de *Trifolium resupinatum* L.: Tibériade, 21.III.1923; Sheich Abrek, 14.III.1940. Connu sur cette plante de Palestine, d'Egypte (REICHERT, 1921) de Maroc (MAIRE et WERNER, 1937) et d'Espagne (FRAGOSO, 1927).
- Sur les feuilles de *Trifolium scabrum* L.: Motsa, 18.IV.1939. Indiqué sur cette plante en Palestine par MAGNUS (1900) à Nazareth et Haifa; indiqué au Liban (MAGNUS, 1900), Maroc (MAIRE et WERNER, 1937); Espagne (FRAGOSO, 1927; UNAMUNO, 1932).
- Sur les feuilles de *Trifolium stellatum* L.: Jérusalem, 27.III.1939; Motsa, 22.III.1937; Beth-Hakerem, 30.III.1939; Rosh-Pina, 12.IV.1927; Yaaroht Hakarmel, 13.III.1940; Naharia, 17.III.1940; Elon, 18.III.1940; Tel-Hai, 19.III.1940. Indiqué sur cette plante hospitalière en Palestine par MAGNUS (1900) au Carmel; connu de Kurdistan assyrien (MAGNUS, 1896), de Maroc (MAIRE et WERNER, 1937); d'Espagne (FRAGOSO, 1927; UNAMUNO, 1931).
- Sur les feuilles de *Trifolium tomentosum* L.: Jérusalem, 3.V.1936; Tel-Aviv, 15.III.1936; Giv'hat Brenner, 10.IV.1939, leg. M. Evenari; Avihail, 7.IV.1939; Kfar Vitkin, 8.IV.1939; Kiryat-Amal, 17.III.1940; Tel-Hai, 19.III.1940. Indiqué sur cette plante hospitalière en Palestine par MAGNUS (1900) près Jaffa; connu de Grèce (SYDOW, 1935), de Maroc (MAIRE et WERNER, 1937), d'Espagne, (FRAGOSO, 1927; UNAMUNO, 1932).

Aux mois de mars et avril, lorsque les *Trifolium* recouvrent de leur tapis multicolore les coteaux et les plaines de la Palestine, il est particulièrement intéressant de voir la dispersion de *Dothidiella trifolii*: certaines espèces de trèfle telles que *Tr. palaestinum*, *Tr. stellatum*, *Tr. tomentosum* sont presque toujours attaquées; les autres le sont par ci par là, d'une façon accidentelle; les autres encore, telles que *Tr. arvense*, *Tr. campestre*, *Tr. pillulare*, *Tr. stenophyllum* et le trèfle cultivé, *Tr. alexandrinum* ne le sont pas du tout et paraissent ne pas contracter cette maladie même au voisinage immédiat des plantes malades.

- 69 (206). *Scirrhia rimosa* (Fr. ex Alb. et Schw.) Fuck. (Stade conidifère: *Hadrotrichum Phragmites* Fuck.)

- Sur les feuilles de *Phragmites communis* Trin.: Tapcha, 21.IV.1935; Kallirrhoe (Transjordanie), 18.III.1936; Ein Haruz près Sodom, 29.VI.1939.

Conidiophores : $23-34 \times 7 \mu$; conidies : $7-11 \mu$; pycnides et périclithes jeunes.

Fam. MYCOSPHAERELLACEAE

70 (207). *Mycosphaerella fragariae* (Schw.) Lind. (Stade conidiifère : *Ramularia Tulasnei* Sacc.)

Sur les feuilles et les pétioles de *Fragaria elatior* Ehrh. cultivé : Pardess-Hana, 4.XII.1937 ; Bnei-Brak, 13.V.1937, leg. H. Habelska.

Les conidiophores se trouvent au centre des taches, sur les deux faces de la feuille (et non seulement sur la face inférieure comme l'indique LINDAU dans sa diagnose) ; conidies : $27-35 \times 2,5-3,5 \mu$, présentant 1 à 2 cloisons. Maladie répandue dans les cultures des fraises et indiquée déjà en Palestine par REICHERT (1939).

Fam. PLEOSPORACEAE

71 (208). *Leptosphaeria Libanotis* Fuck.

Sur les tiges de *Foeniculum piperitum* Presl. : Kiryat-Anavim, 25.I.1936.

Périclithes : $130-215 \times 95-150 \mu$; asques : $64-74 \times 16-19 \mu$; ascospores : $15-21 \times 7-9 \mu$.

72 (209). *Pleospora herbarum* (Pers.) Rabenh.

Sur les tiges et les calices d'*Antirrhinum majus* L. : Jérusalem, 2.II.1937, leg. I. Wahl. Plante hospitalière nouvelle ?

Périclithes : $225-275 \mu$; asques : $135-140 \times 25-30 \mu$; ascospores : $27-30 \times 12-15 \mu$.

Sur les tiges et les feuilles sèches d'*Atriplex roseum* L. : Jérusalem, 20.II.1937, leg. I. Wahl.

Périclithes : $117-220 \mu$; asques : $105-125 \times 25-27 \mu$; ascospores : $25-32 \times 11-13 \mu$.

Sur les tiges et l'involucre floral de *Carlina involucreta* Poir. (mélange au *Pyrenophora coronata*) : Jérusalem, 2.I.1940. Plante hospitalière nouvelle ?

Périclithes : $175-225 \mu$; asques : $110-125 \times 23-25 \mu$; ascospores : $25-32 \times 9-12 \mu$.

Sur les tiges et les bractées florales de *Carthamus tenuis* Boiss. : Jérusalem, 20.I.37. Leg. J. Wahl.

Périclithes : $212-245 \mu$; asques : $75-90 \times 17-22 \mu$; ascospores : $28-32 \times 10-13 \mu$.

Sur les bractées florales de *Centaurea iberica* Trav. : Jérusalem, 6.II.1937. Plante hospitalière nouvelle ?

Périclithes : $275-300 \mu$; asques : $145-198 \mu$; ascospores : $27-30 \times 10-14 \mu$.

Sur les tiges mortes de *Cichorium pumilum* Jacq. : Jérusalem, 2.XII.1936.

Périclithes : $225-250 \times 125-170 \mu$; ascospores : $25-30 \times 14-16 \mu$.

Sur *Cichorium divaricatum* est indiqué par MAIRE et WERNER au Maroc (1937) le *Pleospora vulgaris*. Mais les ascospores de notre champignon sont à 7 cloisons (et non à 5, comme chez *Pl. vulgaris*) et les ascospores correspondent par leurs dimensions à celles

- de *Pl. herbarum* ($27-33 \times 13-15 \mu$ dans la diagnose) et non à celles de *Pl. vulgaris* ($15-21 \times 8-10 \mu$ dans la diagnose).
- Sur les tiges mortes de *Dianthus caryophyllus* L. cult. : Jérusalem, 23.III.1937. Leg. I. Wahl.
Périthèces : 225-250 μ ; asques : $90-115 \times 23-30 \mu$; ascospores : $27-30 \times 11-14 \mu$, avec 7 cloisons transversales et 1, 2 ou rarement trois cloisons longitudinales.
- Sur les espèces de *Dianthus* ont été indiqués : *Pleospora dianthi*, *Pl. herbarum*, *Pl. media* et *Pl. vulgaris*. Notre champignon correspond par tous ses caractères au *Pl. herbarum*.
- Sur les tiges mortes de *Diploaxis tenuifolia* (L.) DC. : Jérusalem, 27.II.1940.
Périthèces : 290-320 μ ; asques : $125-145 \times 18-22 \mu$; ascospores : $25-28 \times 10-13 \mu$.
- Sur les tiges mortes d'*Erysimum crassipes* C.A.M. : Tel-Arza près Jérusalem, 10.II.1940. Plante hospitalière nouvelle.
Périthèces : 212-275 μ ; asques : $125-137 \times 20-26 \mu$; ascospores : $28-32 \times 10-12 \mu$.
- Sur les bractées et le calice de *Garidella unguicularis* Lam. : Ein-Karem, 25.I.1940. Plante hospitalière nouvelle.
Périthèces : 132-245 μ ; asques : $117-125 \times 12-15 \mu$; ascospores : $28-30 \times 10-12 \mu$.
- Sur les tiges mortes d'*Hirschfeldia incana* (L.) Lag. Foss. : Jérusalem, 23.XII.1935.
Périthèces : 230-275 μ ; asques : $126-140 \times 25-27 \mu$; ascospores : $27-33 \times 12-16 \mu$.
- Sur les tiges mortes de *Lactuca Scariola* L. : Jérusalem, 3.III.1940. Leg. J. Stettner.
Périthèces : 370-400 μ ; asques : $125-137 \times 20-25 \mu$; ascospores : $25-35 \times 10-15 \mu$.
- Sur les feuilles mortes de *Laurus nobilis* L. : Jérusalem, 20.I.1940.
Périthèces : 230-330 μ ; asques : $100-140 \times 20-25 \mu$; ascospores : $25-32 \times 10-12 \mu$.
- Sur les tiges mortes de *Mesembryanthemum roseum* Willd. : Jérusalem, 13.IV.1937. Leg. J. Wahl. Plante hospitalière nouvelle ?
Périthèces : 225-240 μ ; asques : $100-125 \times 17-20 \mu$; ascospores : $25-30 \times 8-12 \mu$.
- Sur les tiges mortes d'*Ononis leiosperma* Boiss. (= *O. antiquorum* L.) : Tel-Arza près Jérusalem, 3.II.1940. Leg. J. Stettner.
Périthèces : 280-300 μ ; asques : $100-120 \times 23-25 \mu$; ascospores : $40-46 \times 9-11 \mu$. Les ascospores sont un peu plus étroites que dans les formes typiques.
- Sur les tiges mortes de *Papaver Argemone* L. : Ein-Karem, 25.I.1940.
Périthèces : 210-225 μ ; asques : $112-125 \times 22-25 \mu$; ascospores : $25-30 \times 13-15 \mu$.
- Sur le rachis de *Parkinsonia aculeata* L. : Talpioth, 21.I.1940.
Périthèces : 175-270 μ ; asques : $88-115 \times 18-25 \mu$; ascospores : $30-33 \times 12-14 \mu$.

Sur les feuilles desséchées de *Pirus communis* L. : Kiryat-Anavim, 20.I.1939 ; Moza, 25.I.1939.

Périthèces : 150-250 μ ; asques : 92-140 \times 11-23 μ ; ascospores : 16-30 \times 7-12 μ .

Sur les feuilles sèches de *Pirus Malus* L. : Kiryat-Anavim, 5.I.1939.

Périthèces : 150-210 μ ; asques : 130-165 \times 20-25 μ ; ascospores : 27-34 \times 10-14 μ .

Sur les feuilles de *Quercus calliprinos* Webb. : Jérusalem, 19.I.1940. Leg. H. Blumenfeld.

Périthèces : 235-300 μ ; asques : 114-128 \times 22-30 μ ; ascospores : 23-35 \times 10-15 μ .

Ce même *Pleospora* est indiqué en Russie Asiatique, sur les feuilles tombées de *Quercus mongolica* Fisch., partout (KRAVZEV, 1935). Nous le trouvons en grande quantité, sur les feuilles de notre chêne, encore attachées à l'arbre, au milieu des taches desséchées. Il serait à rechercher sur d'autres chênes et dans d'autres pays.

Sur les tiges mortes de *Reseda alba* L. : Jérusalem, 13.VII.1937. Leg. I. Wahl.

Périthèces : 250-300 μ ; asques : 102-130 \times 17-30 μ ; ascospores : 25-30 \times 12-15 μ .

Sur les tiges mortes de *Rosmarinus officinalis* L. : Jérusalem, 28.VII.1939. Plante hospitalière nouvelle ?

Périthèces : 250-275 μ ; asques : 100-120 \times 17-22 μ ; ascospores : 27-30 \times 10-12 μ .

Sur les tiges mortes de *Salvia triloba* L. : Jérusalem, 4.II.1937. Leg. I. Wahl.

Périthèces : 220-280 μ ; asques : 92-120 \times 22-27 μ ; ascospores : 30-35 \times 12-15 μ .

Sur les tiges mortes de *Santolina Chamaecyparissus* L. : Jérusalem, 20.VI.1936.

Périthèces : 200-250 μ ; asques : 125-172 \times 20-25 μ ; ascospores : 27-32 \times 10-14 μ .

Sur les tiges mortes de *Tolpis virgata* Bert. : Jérusalem, 3.II.1940. Leg. J. Stettner.

Périthèces : 236-300 μ ; asques : 140-162 \times 20-30 μ ; ascospores : 29-32 \times 10-13 μ .

Sur les tiges mortes de *Verbascum sinuatum* L. : Tel-Aviv, 12.V.1937. Leg. J. Wahl.

Périthèces : 162-190 μ ; asques : 75-82 \times 15-17 μ ; ascospores : 25-28 \times 10-12 μ .

Sur les tiges mortes de *Zizyphus Spina Christi* (L.) Willd. : Ramath-Gan, 10.II.1939.

Périthèces : 225-230 μ ; asques : 125-135 \times 20-24 μ ; ascospores : 27-30 \times 12-14 μ .

Forma *siliquaria* Kunze.

Sur les siliques sèches de *Fibigia clypeata* (L.) Medic. : Jérusalem, 10.IV. 1937. Plante hospitalière nouvelle.

Périthèces : 237-300 μ ; asques : 88-100 \times 18-25 μ ; ascospores : 27-32 \times 8-11 μ .

73 (210). *Pleospora salsolae* Fuck.

Sur les feuilles mortes et les rameaux de *Salsola Kali* L. : Nathania, 5.II.1939.

Périthèces : 200-250 × 150-190 μ ; asques : 90-125 × 21-25 μ ; ascospores : 21-32 × 9-12 μ.

74 (211). *Pyrenophora coronata* Sacc.

Sur les bractées florales de *Carlina involucrata* Poir. : Jérusalem, 2.I.1940, (mélangé au *Pleospora herbarum*). Plante hospitalière nouvelle.

Périthèces : 200-250 μ ; asques : 72-85 × 12-20 μ ; ascospores : 16-21 × 7-10 μ.

Fam. VALSACEAE**75 (212). *Valsa mediterranea* de Not.**

Sur les rameaux d'*Olea europaea* L. : Jérusalem, 26.XI.1939. Leg. H. Blumenfeld.

Pseudostroma d'env. 1 mm.; périthèces : 225-300 × 150-220 μ ; asques : 42-48 × 7-9 μ, à 8 ascospores; ascospores : 12-14 × 2-3 μ.

Ce champignon a été signalé dans plusieurs localités d'Italie (TRAVERSO, 1906, p.100), mais à notre connaissance n'a pas encore été indiqué ailleurs.

Fam. PHACIDIACEAE**76 (213). *Rhytisma acerinum* (Pers.) Fries**

Sur les feuilles d'*Acer syriacum* Boiss. et Gaill. : Hanita, 24.VIII.1939, leg. M. Zohary; Elon, 9.XII.1939. Plante hospitalière nouvelle.

Conidies : 5-7 × 1 μ ; asques jeunes sur les feuilles ramassées par terre au mois de décembre.

Fam. HYPODERMATACEAE**77 (I). *Lophodermium Pinastri* (Schrad.) Lév.**

Sur les feuilles de *Pinus canariensis* C. Sm. : Motsa, 14.XII.1937.

Périthèces : 425-500 μ ; asques : 125-166 × 12-14 μ ; ascospores : 100-120 × 1,5-2 μ.

Fam. ASPERGILLACEAE**78 (214). *Aspergillus flavus* (De By.) Wint.**

Sur les moustiques morts : Nesher près Haifa, 4.X.1938. Leg. M. Soliternik ; sur un papillon pourri, Jérusalem, 10.III.1937.

Colonies d'un vert-jaunâtre. Sterigmes non ramifiés ; conidies : 5-7 μ.

79 (215). *Aspergillus ochraceus* Wilhelm

Sur les moustiques morts : Nesher près Haifa, 4.X.1938. Leg. M. Soliternik ; sur un papillon pourri, Jérusalem, 10.III.1937.

Colonies de couleur chamois (250 code des couleurs) ; conidio-phores jusqu'à 1 mm. (d'après la diagnose ils peuvent atteindre 5 mm.) ; sterigmes deux fois ramifiés ; conidies : 3-5 μ.

80 (216). *Aspergillus niger* van Tieghem

Sur un papillon pourri, Jérusalem, 4.X.1938 ; sur diverses substances organiques moisies, fréquent.

81 (217). *Penicillium expansum* Link. (= *P. glaucum* Auct.)

Sur les fruits et matières organiques moisies, partout.

82 (218). *Penicillium digitatum* Sacc.

Sur les écorces des oranges, des citrons et des mandarines. Très fréquent.
Spores : $3.5 \times 5.7,5 \mu$.

83 (219). *Penicillium italicum* Wehmer

Sur l'écorce des oranges et des citrons.
Spores : $3.4 \times 4.4,5 \mu$.

Fam. TERFEZIACEAE.

84 (220). *Terfezia Clavereyi* Chatin

Se vend au marché Machne-Jehuda à Jérusalem fin février, mars et avril et est consommé surtout par les juifs orientaux. Importé de Syrie.

Asques : $64.75 \times 35.53 \mu$, ascospores huit par asque, rondes, finement réticulées : $15.19,5 \mu$.

En 1938, le Professeur WERTHEIMER de l'Université Hébraïque m'a envoyé le contenu intestinal d'un enfant, âgé d'un an et demi et mort à la suite d'un empoisonnement. Ses parents ont rapporté qu'il avait mangé la veille de sa mort un champignon "pareil à une pomme de terre" et peut-être aussi des baies de mandragore. Le contenu intestinal renfermait un grand nombre d'asques octospores. J'en ai fait une préparation microscopique que j'ai envoyée à l'éminent Mycologue de Rabat, M. G. MALENCON. Ce dernier m'a répondu par une lettre détaillée, pour laquelle je tiens à lui exprimer par cette voie aussi ma profonde reconnaissance ; d'après son avis, les asques et les spores appartiennent à *Terfezia Clavereyi* ou tout au plus à une espèce bien voisine. Quant à l'explication de l'empoisonnement, M. MALENCON nous écrit : "à ma connaissance, aucun *Terfezia* n'est toxique. Il faut dire toutefois que ces champignons sont généralement consommés cuits alors que l'enfant l'a mangé cru et l'on sait que certains Ascomycètes (*Pezizes*, *Morilles*) causent parfois des accidents graves quand on les absorbe crus. — Maintenant, l'enfant était bien jeune, et il lui a fallu sans doute peu de choses pour être intoxiqué, à moins qu'il n'ait avalé une plante vraiment toxique, autre que le *Terfezia*."

Fam. MOLLISIACEAE

85 (221). *Pseudopeziza medicaginis* (Lib.) Sacc.

Sur les feuilles de *Medicago hispida* Gaertn. : Sarafand, 9.II.1936.

Asques : 60.78μ ; ascospores : $7.8 \times 3.4 \mu$.

Sur les feuilles de *Medicago tuberculata* Willd. : Tel-Hai, 19.III.1940.

Apothécies : 275.300μ ; asques : $65.75 \times 10.15 \mu$; ascospores : $7.9 \times 4.5 \mu$.

86 (222). *Pseudopeziza trifolii* (Biv. Bern.) Fuck.

Sur les feuilles de *Trifolium formosum* Urv. : Beth-Hakerem, 14.IV.1939.

Apothécies : 210-215 μ ; asques : 73-76 \times 9-10 μ ; ascospores (en deux rangées) : 10-14 \times 5-6 μ .

Fam. *HELOTIACEAE*

87 (223). *Pitya cupressi* (Batsch) Rehm

Sur les rameaux feuillés de *Cupressus* tombés par terre : Tel-Aviv, 6.I.1940 ; Pardess Hana, 10.II.1940.

Apothécies : 1-2 mm., de couleur orange ; asques : 112-170 \times 10-12 μ , ascospores : 9-10 μ , encore insuffisamment formées et portant rarement une grosse goutte d'huile au centre ; paraphyses minces, 2 μ , s'élargissant vers leur sommet jusqu'à 3 μ .

Fam. *PEZIZACEAE*

88 (224). *Sepultaria arenosa* (Fuck.) Rehm

Sous les *Pinus halepensis*, Jérusalem, 3.I.1940 ; Leg. H. Habelska ; Ganegar, 31.I.1938 ; Motsa, 20.I.1940 ; Kiryat-Anavim, 25.I.1940.

Apothécies en groupes, presque enfouies dans la terre, s'ouvrant par des lambeaux irréguliers, charnues, 1-3 cm., recouvertes à l'extérieur par des poils bruns (7-10 μ de diam.) ; asques cylindriques, arrondies au sommet, 187-225 \times 19-20 μ ; ascospores, huit par asque, elliptiques, hyalines, renfermant au centre une grosse goutte d'huile, disposées en une seule rangée, lisses. 20-29 \times 12-15 μ ; paraphyses filamenteuses, septées, incolores, 3 μ à leur base, élargies au sommet jusqu'à 5 μ .

89 (225). *Barlaea cinnabarina* (Fuck.) Sacc.

Par terre : Jérusalem, 16.I.1940, Leg. H. Habelska.

Apothécies en groupes serrés, 1-4 mm. de couleur rouge-cinabre. Asques : 240-300 \times 18-20 μ ; ascospores rondes, 12-18 μ ; paraphyses filamenteuses.

Fam. *HEVELLACEAE*

90 (226). *Helvella lacunosa* Afzel.

Par terre ; entre les mousses. Motsa, 9.I.1940. Leg. H. Habelska.

Diamètre du chapeau : 2-3 cm ; stipe : 1,5-2 \times 1-1,5 cm ; asques : 212-257 \times 15-18 μ ; ascospores : 15-20 \times 12-14 μ , avec une grande goutte d'huile au milieu de chaque spore ; paraphyses : 3 μ de diamètre, s'élargissant vers le sommet jusqu'à 8 μ .

Bien que tous nos exemplaires sont de petite taille (exemplaires jeunes ?) et par ce caractère se rapprochent de *Helvella Queletii* Bresadola, par tous leurs autres caractères ils appartiennent à l'espèce *H. lacunosa*. Notamment (voir R. HEIM et L. REMY, 1932), l'hyménophore est mitré et a dès le début le port helvelloïde (et non cyathiforme comme chez *H. Queletii*) ; le stipe est massif et sa largeur dépasse même le tiers du chapeau (et non gracile et rétréci aux extrémités comme chez *H. Que-*

letii). Les caractères microscopiques de ces deux champignons sont à peu près les mêmes.

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A MONOGRAPHIC STUDY ON THE GENUS *BELLEVALIA* LAPEYR.

(CARYOLOGY, TAXONOMY, GEOGRAPHY)

By NAOMI FEINBRUN

(Continued)

(With Plates XVII—XX and figures 30—36 in the text)

BELLEVALIA¹

Lapeyrouse in Journ. Phys. 67: 425 (1808); Endl. Gen. Pl. 144 (1836-40); Kunth Enum. Pl. 4: 306 (1843) p.p.

syn. *Bellevalia* Sect. *Eubellevalia* Boiss. Fl. Or. 5: 301 (1884); Fl. URSS 4: 396 (1935). — *Hyacinthus* § *Bellevalia* Baker, Lin. Proc. 11: 424 (1871) p. p.; Benth et Hook. f. Gen. 3: 812 (1883); Engl. u. Prantl, Nat. Pflanzenfam. II, 5: 68 (1889) et 2. Aufl. 15a (1930); Aschers. u. Graebn. 3: 265 (1903-07).

Perigonium campanulate or tubular-campanulate or turbinate, not constricted under the lobes, with expanded not revolute lobes. Filaments adherent up to the base of lobes; anthers attached at their middle, introrse. Upper flowers sometimes sterile; perigonium white turning grey or lurid, or buds of flowers violet or purple-lilac or pale-blue, changing during flowering to livid or greenish or yellowish, finally grey or livid; rarely perigonium deep-violet or deep-blue or pale-blue or pale-lilac not changing during flowering. Bracts membranous, generally small or very much reduced in size. Capsule triquetrous with three acute ribs or sometimes lobes or wings; valves ovate or round or oblong or obovate, retuse or rounded at apex and cuneate or rounded at base; ovules 2-6 in each cell. Seed globular or ellipsoid, smooth, black or bluish and often covered with a waxy bloom, with white hilum and lacking a caruncula. Bulbed geophytes. Leaves lorate or lanceolate, with a hyaline membranous margin, often ciliate or scabrous. Raceme conical or cylindrical or ovate or rarely spike-like.

¹ I wish to express my gratitude to Mr J. E. DINSMORE, Jerusalem, as well as to the Directors of the Herbaria and Botanical Institutes in Alger, Brno, Cairo, Coimbra, Firenze, Geneva, Graz, Liège, Leningrad, Paris, Prag, Roma, Tartu, and Vienna for their kindness in lending me herbarium material of *Bellevalia*.

Diagnoses of sections

Sect. I. *Nutans* Feinbr. sect. nov.

Racemus floriferus et fructiferus cylindricus; pedicelli omnes fere aequilongi, plerumque nutantes. Perigonium plerumque nervibus viridibus obsitum, ante anthesin violaceum vel caeruleum, interdum flavido-virens vel albo-virens, sub anthesi lividum vel luridum. Folia scapo aequilonga vel breviora, rare longiora. Capsulae valvae basi rotundatae, apice saepe retusae, longitudine fere latitudini aequa. Area generis.

Subsect. 1. *Colorata* Feinbr. subsect. nov.

Perigonium ante anthesin non album. Area generis.

1. *trifoliata*, 2. *macrobotrys*, 3. *dubia*, 4. *Webbiana*, 5. *Lipskyi*, 6. *Clusiana*, 7. *Tauri*, 8. *dichroa*, 9. *Aucheri*, 10. *lutea*, 11. *Fomini*, 12. *mauritanica*.

Subsect. 2. *Albiflora* Feinbr. subsect. nov.

Perigonium ante anthesin album, viride-nervosum. Area: Palestina et Aegyptus Inf.

13. *Warburgii*, 14. *alexandrina*, 15. *Eigii*.

Sect. II. *Conica* Feinbr. sect. nov.

Racemus fructiferus conicus. Racemus floriferus conicus vel ovatus vel oblongus. Capsulae valvae apice retusae, basi cuneatae, plerumque oblongae vel obovatae. Folia scapo plerumque breviora, margine ciliata. Perigonium ante anthesin violaceum vel lilacinum vel album; sub anthesi lividum vel luridum. Area fere eadem generis.

Subsect. 1. *Orientalis* Feinbr. subsect. nov.

Perigonium ante anthesin violaceum vel lilacinum. Area praecipue Iranica.

16. *ciliata*, 17. *longipes*, 18. *trojana*, 19. *araxina*, 20. *longistyla*, 21. *sarmatica*, 22. *gracilis*, 23. *albana*, 24. *glaucia*, 25. *Wilhelmsii*, 26. *montana*.

Subsect. 2. *Occidentalis* Feinbr. subsect. nov.

Perigonium album. Area praecipue Irano-Turanica (Mesopotamica).

27. *Saviczii*, 28. *speciosa*, 29. *latifolia*, 30. *stepporum*, 31. *palmyrensis*, 32. *Zoharyi*.

Sect. III. *Patens* Feinbr. sect. nov.

Racemus fructiferus cylindricus, floriferus cylindricus vel oblongus vel ovatus. Folia plerumque scapo longiora. Pedicelli floriferi erecto-patuli plerumque floribus breviores vel nulli. Bractae saepe con-

spicuae. Capsulae valvae ovatae vel rotundae vel ellipticae, basi rotundatae. Plantae non elatae. Area — pars centralis generis areae : Mediterranea, Saharo-Sindica media et occidentalis et Irano-Turanica Mesopotamica.

Subsect. 1. *Romana* Feinbr. subsect. nov.

Fructus — capsula ad maturitatem apice dehiscens, non decidua. Flores et capsulae plerumque pedicellati. Area sectionis.

33. *romana*, 34. *variabilis*, 35. *fallax*, 36. *densiflora*, 37. *nivalis*, 38. *flexuosa*, 39. *Mosheovii*, 40. *decolorans*, 41. *kurdistanica*.

Subsect. 2. *Cavarea* (Mattei) Feinbr. comb. nov.

SYN. *Cavarea* Mattei in Bul. Ort. Bot. Nap. 5 : 275 (1918).

Fructus indehiscens, deciduus. Flores et capsulae subsessiles vel sessiles. Area Saharo-Sindica media.

41. *sessiliflora*, 42. *desertorum*.

Sect. IV. *Muscarioides* Feinbr. sect. nov.

Racemus fructiferus cylindricus, floriferus cylindricus vel ovatus. Perigonium campanulatum violaceum vel caeruleum, sub anthesi non commutans. Pedicelli sub anthesi nutantes. Area : Asia Media.

43. *atroviolacea*, 44. *turkestanica*.

Key to the species of *Bellevaia* ¹

1. Fruiting raceme conical (i.e. the lower pedicels distinctly longer than the upper ones). Valves of capsule generally oblong or obovate, cuneate at base, retuse at apex, longer than broad..... 2
- Fruiting raceme cylindrical (i.e. the lower pedicels about as long as the middle and the upper ones or the flowers almost sessile.) Valves of fruit mostly ovate, rounded at base, generally not retuse at apex, only slightly if at all longer than broad..... 18
2. Flower buds violet or lilac or blue; during anthesis the colour of perigonium changes from the base to dirty-violet or to greenish, finally turning livid..... 3
- Flower buds white; perigonium green-nerved or not, during anthesis turning lurid..... 13
3. Lower flowering pedicels at least 3 times as long as flower..... 4
- Lower flowering pedicels shorter..... 7

¹ For the determination of the *Bellevaia* species, the fruiting raceme and notes on the colour of flower and of flower bud are indispensable. It is therefore necessary to collect these species in flowering and in fruiting state. Exact notes have to be made on the colour of living perigonium and its changes.

4. Margin of leaf glabrous or slightly scabrous. Perigonium 9-13 mm long. Leaves canaliculate, ascending, then recurved, about as long as scape, blackish when dried. Pedicels at least 4 times as long as flower. Lobes of perigonium as long as tube, rarely shorter. Segetal plants of Palestine, Syria, Cilicia and N. Iraq *B. longipes* Post.
- Leaves ciliate at margin, shorter than scape. Plants presenting other characters 5
5. Mediterranean plants. Perigonium 9-11 mm. (rarely 8 mm) long, lilac, with greenish lobes. Flowering pedicels nodding
B. ciliata (Cyr.) Nees.
- Non-Mediterranean plants (S. Russia, Caucasus, Transcaucasia and Asia Minor), presenting a different set of characters 6
6. Flowering pedicels erect-patulous, 3-7 cm. long. Flowering raceme 10-15 cm. long, 40-80 flowered. S. Russian and Caucasian plants *B. sarmatica* (Pall.) Wor.
- Flowering pedicels nodding, 2-2,5 cm. long. Flowering raceme 6-10 cm. long, 30-40 flowered. Plants of Transcaucasia and N. Asia Minor *B. albana* Wor.
- 7 (3). Perigonium 11-12 mm. long 8
- Perigonium 5,5-10 mm. long 9
8. Pedicels 2-3 times longer than perigonium. Outer leaf 2,5-4 cm. broad *B. araxina* Wor.
- Pedicels as long as flower. Outer leaf not exceeding 2 cm. in breadth *B. longistyla* (Miszcz.) Grossh.
- 9 (7). Perigonium 8-10 cm. long. Leaves strap-shaped, 12-15 mm. broad. Raceme few-flowered. Plants of W. Asia Minor (Plate XIX, 13) *B. trojana* Feinbr. sp. n.
- Plants presenting other characters 10
10. Flower-buds blue; perigonium 5,5-7 mm. Leaves 1-1,5 cm. broad. Small plants (15 cm.) *B. montana* (C. Koch.) Boiss.
- Plants presenting other characters 11
11. Raceme much shorter than the free portion of scape. Leaves 2-3, 27-32 mm. broad. Perigonium 6-7,5 mm. long. Plants of Anatolia (Plate XIX, 14) *B. gracilis* Feinbr. sp. n.
- Plants presenting other characters 12
12. Flowering pedicels 1,5-2 times longer than flower. Leaves 5-6. Raceme 25-60-flowered, longer than the free portion of scape. Capsule retuse at apex (Plate XIX, 15) *B. glauca* (Lindl.) Kth.
- Flowering pedicels slightly longer than flower. Leaves 3-4. Capsule non-retuse. Transcaucasian plants *B. Wilhelmsii* (Stev.) Wor.
- 13 (2). Outer leaf 3 cm. or more broad. Perigonium 7-8 mm. long. Raceme many-flowered (up to 100); pedicels three or more times longer than flower. Transcaucasian plants *B. speciosa* Wor.
- Plants presenting other characters 14

14. Leaves much shorter than flowering scape, broad-lanceolate to elliptical, mostly 4 cm. or more broad, suddenly narrowed at ground. Flower-bud white, green-nerved, turning lurid early at the beginning of flowering. Perigonium 10-13 mm. long. Pedicels nodding during anthesis (Plate XVIII, 9)
B. latifolia Feinbr. sp. n.
- Plants presenting other characters15
15. Perigonium 6-9 mm. long, white, not turning lurid until withering, umbilicate at base. Anthers not reaching the apex of lobes. Lobes slightly shorter than tube. Fruiting pedicels 2.5-3 cm. long. Small (15 cm.) Syrian plants (Plate XVIII, 8)
B. palmyrensis Feinbr. sp. n.
- Plants presenting other characters16
16. Small plants (10-15 cm.). Flowering raceme almost sessile, dense, 15-35-flowered, 2-3.5 cm. broad. Perigonium during anthesis pale-lurid. Flowering pedicels somewhat shorter to somewhat longer than flower; fruiting pedicels 1.5-2 cm. long (Plate XVIII, 10)*B. Zoharyi* Feinbr. sp. n.
- Larger plants with different characters17
17. Leaves longer than scape, linear, 5-20 mm. broad. Raceme 15-30 flowered. Perigonium 7-10 mm. long, soon turning lurid, in herbarium dusky-brown. Transcaspian, Afghanian and Persian plants*B. Saviczii* Wor.
- Leaves lanceolate to lorate, about as long as scape, 20-30 mm. broad. Raceme 25-50-flowered. Perigonium 9-12 mm. long, turning pale greyish-brown at the end of flowering. Syrian and Palestinian plants (Plate XVIII, 6, 7)*B. stepporum* Feinbr. sp. n.
- 18 (1). Perigonium violet or dark-blue, not turning livid during anthesis. Plants of Russian Middle Asia19
- Colour of perigonium different, or if as above, turning livid during flowering20
19. Perigonium dark-violet, colour not changing even when dried. Length of perigonium 8-9 mm*B. atroviolacea* Rgl.
- Perigonium dark-blue, 6 mm. long*B. turkestanica* Franch.
- 20 (18). Plants of S. Europe or of N. Africa. Leaves lorate, much longer than scape, with glabrous margin. Outer leaf 4-20 mm. broad. Perigonium 5-10 mm. long21
- Plants with a different set of characters25
21. Lobes of perigonium as long as or longer than tube, oblong. Pedicels mostly as long as or longer than flower22
- Lobes distinctly shorter than tube, ovate23
22. Pedicels erect-patulous. Perigonium turbinate, gradually broadening from base, 8-10 mm. long. Plants of S. Europe
B. romana (L.) Rchb.
- Pedicels horizontal. Perigonium suddenly broadening under lobes, 6.5-9 mm. long. Plants of N. Africa*B. variabilis* Freyn.

- 23 (21). Plants of N. Africa. Perigonium 7-10 cm. long, blue at base changing to pink or lilac-purple towards lobes. Outer lobes pink or purplish-lilac, the colour at least partly not vanishing in dried specimens. Outer leaf 4-8 mm. broad
B. fallax Pom.
- Plants of S. Europe. Colour of perigonium different 25
24. Colour of perigonium light-violet before flowering, reddish-grey during flowering. Lobes of perigonium connivent. Leaves erect; outer leaf 10-20 mm. broad. Pedicels mostly as long as or longer than perigonium. N. Italian plants .. *B. Webbiana* Parl.
- Flower bud light-blue, then perigonium violet or dark-greenish to 2/3 of its length, lobes brighter, green-nerved. Leaves prostrate, outer leaf 4-13 mm. (generally less than 1 cm) broad. Pedicels generally shorter than flower
B. dubia (Guss.) R. et S.
- 25 (20). Perigonium greyish-lilac with blackish lobes. Anthers yellow. Transcaucasian plants *B. Fomini* Wor.
- Lobes of perigonium not blackish 26
26. Plants of Asia Minor, 30-40 cm. high. Perigonium 4-7 mm. long. Lobes of perigonium about as long as to 2/3 as long as tube. Outer leaf 7-12 mm. broad. Pedicels about as long as flower to twice as long 27
- Plants with a different set of characters 28
27. Pedicels 1,5-2 times longer than flower. Perigonium 4-6 mm. long *B. Çlusiana* Griseb.
- Pedicels about as long as flowers. Perigonium 6-7 mm. long (Plate XVII, 4) *B. Tauri* Feinbr. sp. n.
- 28 (26). Pedicels nodding. Flower-buds violet or yellow. Perigonium turning first light-violet or yellowish-green at the lower part, then livid; lobes greenish 29
- Pedicels not nodding, often very short or if nodding, flower-buds white with green nerves 34
29. Perigonium 5-7 mm. long. Crimean or Transcaucasian plants 30
- Perigonium 8-16 mm. long 31
30. Crimean plants. Flowering pedicels somewhat shorter than flower. Margin and sometimes lower surface of leaves scabrous
B. Lipskyi (Misch.) Wulff.
- Transcaucasian plants. Pedicels 1,5-2 times longer than flower. Margin of leaf ciliate *B. lutea* Bordz.
- 31 (29). Lobes of perigonium twice as long as tube; perigonium 8-9 mm. long. Persian plants *B. dichroa* Hausskn.
- Lobes of perigonium half as long as tube or shorter 32
32. Outer leaf less than 15 mm. broad; margin of leaves glabrous. Perigonium 13 mm. long. Persian plants. Pedicels about half as long as flower *B. Aucheri* Bak.
- Outer leaf at least 15 mm. broad 33

33. Flowering pedicels as long to half as long as flower. Perigonium 9-16 mm. long, light-lilac at base at the beginning of anthesis. Fruiting pedicels not longer than flower
B. trifoliata (Ten.) Kth.
- Flowering pedicels longer than flowers. Perigonium zygomorphic, 8-11 mm. long, yellowish at base at the beginning of anthesis. Fruiting pedicels longer than flower, arcuate and generally bent near axis (Plate XVII, 1) *B. macrobotrys* Boiss.
- 34 (28). Perigonium dusky-violet, 8-12 mm. long. Lobes somewhat shorter than to half as long as tube. Pedicels somewhat shorter than flower. N. African plants *B. mauritanica* Pomel.
- Flower buds white or light-blue or light-lilac, perigonium not violet during anthesis. 35
35. Perigonium with green nerves, almost reaching its base, length of perigonium 10-14 mm. Raceme many-flowered, 10-35 cm long. Pedicels as long to twice as long as flowers 36
- Perigonium and raceme different 38
36. Leaves erect and canaliculate with short-ciliate or scabrous margin. Capsule 9-11 mm. long. Plants of cultivated fields of Palestine or of the Mediterranean littoral of Egypt..... 37
- Leaves prostrate. Capsule 12-15 mm. long. Raceme, almost sessile. Steppe plants of S. and E. Palestine (Plate XVII, 3)
B. Eigii Feinbr. sp. n.
37. Pedicels nodding during flowering, 1,5-3 cm. long. Fruiting pedicels 2,5-5 cm. long. Segetal plants of Palestine (Plate XVII, 2)
B. Warburgii Feinbr. sp. n.
- Pedicels erect-patulous during whole flowering, somewhat longer than flower. Fruiting pedicels 1,5-2 cm. long. Plant of Lower Egypt (Plate XVII, 5) *B. alexandrina* Feinbr. sp. n.
- 38 (35). Flowers sessile or almost. Perigonium light-lilac or light-blue; lobes oblong, as long or sometimes longer than tube. Valves of fruit almost round; the mature fruit falls as a whole.... 39
- Flowers different; fruit—a true capsule not falling at maturity 40
39. Perigonium 8-13 mm. long. Leaves 2-7, prostrate and flat. Palestinian plants *B. desertorum* Eig et Feinbr.
- Perigonium 5-6 mm. long. Leaves 2-3, canaliculate, erect-recurved. N. African plants *B. sessiliflora* (Viv.) Kth.
- 40 (38). Perigonium and anthers yellow. Raceme head-like or spike-like. Pedicels erect. Perigonium 8-10 mm. long. Syrian plants
B. densiflora Boiss.
- Anthers violet or blue. Perigonium not yellow 41
41. Persian plants. Pedicels very short (2-3 mm.). Leaves 6 mm. broad, margin glabrous. Perigonium light-blue, turning greyish when dried, 7-8 mm. long. *B. decolorans* Bornm.
- Pedicels longer, or if as short, leaf margin ciliate or scabrous. 42

42. Flower buds lilac; flowering perigonium white, turning grey only at withering. Flowering and fruiting pedicels erect-patulous. Scape erect. Leaves 5-6. Plants of Iraqian Kurdistan (Plate XIX, 16) *B. kurdistanica* Feinbr. sp. n.
- Plants of Palestine, Syria and Cyprus, different from the above 43
43. Scape flexuose. Flowering pedicels somewhat shorter to somewhat longer than flower. Perigonium turbinate, soon turning lurid. Fruiting pedicels thin, about 1 cm. long (Plate XVIII, 11) *B. flexuosa* Boiss.
- Pedicels shorter or 0 44
44. Valves of capsule almost round, 5-6 mm. in diameter. Perigonium 7-8 mm. long. Margin of leaves short-ciliate or scabrous. Outer leaf 2-11 mm. broad. Syria and Cyprus
B. nivalis Boiss. et Ky.
- Valves of capsule ovate, 9-11 mm. long, 9-10 mm. broad. Perigonium 7-10 mm. long. Margin of leaves short-ciliate. Outer leaf 8-17 mm. broad. Steppical plants (Plate XVIII, 12)
B. Mosheovii Feinbr. sp. n.

SECT. *NUTANS*SUBSECT. *COLORATA*1. *B. trifoliata* (Ten.) Kth.

Kunth, Enum. 4:308 (1843); Boiss. Fl. Or. 5:303 (1884); Gren. et Godr. Fl. Fr. 3:217 (1855-6); Halascy Fl. Gr. 3:264 (1904); Hayek Fl. pen. Balc. 3:85 (1933); Post Fl. : 798 (1896).

ICON. Tenore Fl. Nap. t. 136; Cavalier Notes t. 1, fig. A.

SYN. *Hyacinthus trifolius* Ten. Fl. Nap. 3:376 (1824); Baker in Linn. Proc. Botany 11:431 (1871); Fiori Nuov. Fl. an. d'Ital. 1:261 (1923-25); Rouy, Fl. Fr. 12:434 (1910). — *H. abortivus* Cavalier Notes 14 (1848). — *B. abortiva* (Caval.) Gren. Fl. Fr. 3: 217. — *B. pendulina* Chiov. Bull. Soc. Bot. Ital. 283 (1894). — ? *B. syriaca* Herb. in Lindl. Bot. Reg. Misc. Mat. 88 (1844).

25-60 cm. Bulb medium or large (2.5-5 cm.), deep. Leaves 2-4 (rarely 6), lanceolate, erect, longer or somewhat shorter than flowering scape; margin ciliate or scabrous or glabrous; outer leaf 12-30 mm. broad. Flowering raceme cylindrical, 20-40-flowered, 3-12 cm. long, 2.5-4 cm. broad, axis often reddish-violet. Flowering pedicels as long to half as long as flower, almost erect before flowering, then nodding, at last horizontal. Perigonium narrow, tubular-campanulate, sometimes slightly zygomorphic, 9-16 mm. (mostly more than 10 mm.) long, deep-violet in bud, before anthesis violet at base and light-violet above, during anthesis turning livid; lobes olive-coloured and green-nerved, ovate or oblong, $\frac{1}{2}$ - $\frac{3}{4}$ as long as tube. Anthers violet, shorter than filament. Fruiting raceme cylindrical, up to 5 cm. broad; fruiting pedicels horizontal or slightly incurved, not longer than flower. Valves of capsule broad-ovate. Seed generally globular. $2n=8$.

Described from Apulia (S. Italy).—In fields.—Geogr. area: Med. France (May-June); Italy (March-April); Greece, Turkey (including Asia Minor)

(March-May); Syria, Palestine (February-March). — Omni-Mediterranean species.

Some of the specimens seen (partly in living state): FRANCE: Toulon (1857, 1859 *Chambeiron* HV); champs près du Pradet (1878 *Albert* HB); La Garde, près Toulon, dans les champs (1888 *Albert* HD HF HP HV); ITALY: Roma, alla Magliana nella vigna (1896 *Chiovena* HR, sub *B. pendulina* Chiov.); sul Gianicolo (1890 *Salomonsohn* HR); in arvis Apuliae, Foggia (*Tenore*; autent. spec.! HF); Bordighera, in oleaetes (1906 *Bicknell* HD HV HP HR); Genova, (1927 *Feroli* HJ); Grassetto bei Vicenza (1880 *Penzig* HP HV); Liguria occid, Mt. Berico, Vicenza (1880 *Bizzozaro* HF). GREECE: Insula Chios, in arvis (1931 *Guil* HG); in ins. Aegina (1881 *Heldreich et Holzmänn* HB); Rhodus (1845 *Heldreich* HD HV HF); Rhodus (1907 *Sternbeck* HP). CYPRUS: Chypre (*Labillardiere* HD). TURKEY: Constantinopel, Domusdere (1896 *Nemetz* HV); in Cilicia (1834 *Montbret* No. 1477 HV). SYRIA: Beyrouth, Hasmié (1883 *Peyron* HD); Beyrouth, in cultis (1883 *Peyron* HD); Beirut (1878 HD; 1931 HJ); Sarada (1877 *Post* HDi). PALESTINE: Upper Galilee: Kefar Gileadi (1925 E); Mt. Carmel (1922 E). Esdraelon Plain: Ein Harod (1926 E; 1930 ZF). Sharon: Hedera (1922, 1924 E); Pardess Hanna (1936 *Durdevani*); Petah Tikva (1922 E). Shefelah: Wadi Misrara (1921, 1922 E); Rischon le Zion (1925 E). (All in HJ).—

This species varies only to a slight degree. FIORI (1923-1925) records two varieties, var. *typica* and var. *pendulina* (= *B. pendulina* Chiov.), the latter reported to differ from the former by the smooth leaf margin. The examination of four authentic specimens of CHIOVENA from the "locus classicus" showed, however, that they do not differ in this regard from other specimens of *B. trifoliata* from Italy, France or Greece.

An authentic specimen of TENORE from Apulia examined by us has rather small flowers (9 mm.). If this small-flowered form (var. *apulica*), is constant, the more common, big-flowered form should be called var. *abortiva* (Caval.), described 1848 under *B. abortiva* Caval. *B. pendulina* Chiov. is to be regarded then as identical with this last variety.

A constant and distinct form is that from the environs of Beirut (Syria), characterized by the smaller size of plant and flexuose scape. This form could be named var. *flexuosa*.

We have not seen the plant described under *B. syriaca*, from eastern Syria (Aleppo or Damascus) which BOISSIER holds for identical with *B. trifoliata*. This synonym remains to be verified.

The area of *B. trifoliata* is rather disjunct. Moreover, the stations of this species are scattered in the various parts of its area (in S. France only about Toulon, in Italy at San-Remo in the NW, at Vicenza in the NE, in Rome in the centre and at Apulia in the South). This discontinuity of habitats in Italy can hardly be explained by insufficiency of available data. In Palestine too the habitats of this species are dispersed within the Coastal and Esdraelon Plains. *B. trifoliata* is everywhere confined to secondary habitats, such as fields etc. In Palestine we know it to occur only in deep, heavy and somewhat wet soils. In France it is apparently not adventitious as recorded.

This species is probably one of the most ancient of the living species of the genus.

2. *B. macrobotrys* Boiss.

Boiss. Diagn. Ser. I, 13:35 (1854); Boiss. Fl. Or. 5:303 (1884); Post Fl. 798 (1896); Post Fl. sec. ed. 2: 651 (1933).

ICON. Tab. nostra XVII, 1.

SYN. *B. zygomorpha* Wor. in Bul. Jard. Bot. Princ. USSR. 1927; Grossh. Fl. Cauc. 1:233 (1928); Fl. URSS 4:398 (1935).

30-60 cm. Bulb medium or large (up to 5 cm.) rather deep in the ground. Leaves 2-4, lanceolate or strap-shaped, somewhat shorter to somewhat longer than scape, erect, convolute with ciliate or almost glabrous margin; outer leaf 1.5-3.5 cm. broad. Flowering raceme cylindrical, loose, 20-50-flowered, 10-25 cm. long, 3-4 cm. broad; axis generally reddish-violet above, mostly with some sterile flowers at top. Flowering pedicels often almost verticillate, longer than flower, becoming nodding before anthesis, then horizontal or curved upward; fruiting pedicels incurved near the axis, arcuate, 12-25 mm. long. Perigonium broadly tubular-campanulate, zygomorphic and somewhat gibbous at base, 8-11 mm. long, lobes ovate, $\frac{1}{2}$ - $\frac{1}{4}$ as long as tube, lower lobe longer than others; flower bud violet, flowering perigonium olive-green, violet at base, turning livid with green-nerved lobes during flowering. Anthers violet, as long as the linear filaments. Fruiting raceme cylindrical, 15-30 cm. long, ca. 5 cm. broad. Valves of capsule broadly ovate or almost round, obtuse. Seeds globular.—March-May.— $2n=8$.

Described from Palestine (betw. Ramleh and Jerusalem and south of Gaza). Type in Geneva. — In crop fields. — Geogr. area: Palestine, Syria, Iraq, Transcaucasia, Algeria. — Irano-Turanian species.

Specimens seen (partly in living state): PALESTINE: Betw. el Qubab and Ramleh (1936 EFZ HJ); betw. Zakkariah and Beith Guvrin, field (1932 EF HJ). SYRIA: Muslemie (1931 Z HJ); Idlib (1935 Gombault); in agris pr. pag. Kheilan (1865 Haussknecht). IRAQ: Euphrates Exped. near Bomboudseh (1836 Col. Chesney No. 106 HD HV); Qizil Robat (1932 Guest HJ); env. of Baquba (1933 EZ HJ); Amadia (1931 Guest HJ); Diana plain near Rowanduz (1933 EZ HJ). CAUCASUS et TRANSCAUCASIA: Aksa pr. Schemacha (Bayern No. 58, det. Boissier HL); prov. Dagestan, Derbent, Sary-kaja (1902 Alexeenko HL); Derbent (1931 Smoljanikov HL); pag. Akhsaglar, Lenkoran distr. (1907 Kazn. et Shelkovnikov HL); Azerbajdzahn, pag. Arab-Mechsibek (1930 Sachokia HL); gub. Baku inter pag. Kurt-maschi et Karamatjan (1902 Alexeenko HL); betw. Qjurdamir and Akhsu (1928 Grossheim et Sachokia HL); betw. Shemacha and Qushchi (1928 Grossheim et Sachokia HL).

ssp. *Pomelii* (Maire) Feinbr. comb. nov.

SYN. *B. Pomelii* Maire, Contr. Fl. d'Afrique du Nord, fasc. 23:231 (1935).

Leaves 4-6. Fruiting pedicels horizontal, growing but little after flowering. Perigonium somewhat narrower.

Geogr. area: Algeria.

Specimens seen: ALGERIA: Oran, champs chez les Ghamras (*Pomel* HJ; auth. spec.!).

The original description of BOISSIER is inexact in two respects: the colour of perigonium is given as "caerulei tandem livescenti"; the colour of anthers "rubello-ferruginea". This was probably the cause of much confusion with regard to this rather rare species. POST evidently confused it with *B. Warburgii*. He described the perigonium as "bluish to whitish or livid". WORONOW (1927) emphasizes that *B. macrobotrys* does not occur in Transcaucasia, as recorded by BOISSIER. Instead *B. Fomini* Wor. (= *B. macrobotrys* ssp. *caucasicum* Miscz.) occurs. In my opinion *B. Fomini* is morphologically and ecologically rather remote from this species, although belonging to the same section. On the other hand WORONOW does not differentiate his *B. zygomorpha* from *B. macrobotrys*. Yet the former does not differ at all from *B. macrobotrys*, as we have seen from a comparison of several authentic specimens of *B. zygomorpha* and of a specimen of BOISSIER from Shemacha, with specimens of *B. macrobotrys* from the classical station (betw. Ramleh and Jerusalem, in crop fields). Zygomorphic flowers reported for *B. zygomorpha* are found in *B. macrobotrys* as well as in some other species, such as *B. Warburgii*, etc.

The taxonomic value of the Algerian ssp. *Pomelii* requires further investigation, especially on living material. MAIRE¹ (1935) described this plant from dried specimens which were collected by Pomel in Oran and mentioned in a note by BATTANDIER et TRABUT (1895, p. 66). Although the colour of flower is not recorded in the description, one can guess from the dried specimens that it is similar to that of *B. macrobotrys* or *B. trifoliata*. MAIRE does not record any differential characteristics between his species and *B. macrobotrys*. However, the plant is hardly to be distinguished from the last species.

We regard this plant for the moment as a separate subspecies, in consideration with its own area of distribution and because we could not decide about its identity with *B. macrobotrys* for lack of sufficient material.

We did not include *var. minor* POST in *B. macrobotrys*; without the type specimen we could not decide whether it belongs to this species or to *B. Warburgii* with which POST confused it.

Most related morphologically and ecologically to *B. macrobotrys* is *B. trifoliata*. The differences between these two species are summarised in the following table:

Characters	<i>B. macrobotrys</i>	<i>B. trifoliata</i>
Length of perigonium	8-11 mm. usually ca. 1 cm.	9-16 mm., usually more than 1 cm.
Breadth of perigonium	broad	narrow
Shape of perigonium	zygomorphic	generally actinomorphic
Colour of flowering perigonium tube	olive-green with violet	light-violet with violet
Length of flowering pedicels	longer than flower	shorter than flower (rarely as long)
Length of fruiting pedicels	much longer than flower	not longer than flower
Length of raceme	very long	short
Fruiting pedicels	arcuate, bent near axis	horizontal or slightly arcuate

¹ I am indebted to Prof. R. MAIRE for his kind sending of a specimen of this plant from Oran.

The area of distribution of the species is disjunct, which is evidence to its early appearance. There are gaps in the area between Transcaucasia and Iranian Kurdistan, between Iraq and Palestine-Syria and between the latter countries and Algeria. New findings can be expected from Persia. If further investigation will show that the Algerian plant has a value of a separate species, this species would be regarded as vicarious with respect to *B. macrobotrys*.

In Palestine *B. macrobotrys* is a rather rare plant with special ecological requirements. It grows in cultivated fields on heavy, hardly permeable soils poor in calcium.

3. *B. dubia* (Guss.) R. et S.

Roem. et Schult. Syst. 7:586 (1830); Kunth, Enum. 4:308; Boiss. Fl. Or. 5:302 (1884) (excl. syn. *B. Clusiana* Griseb.); Freyn, in Flora 68,5:93 (1885); Halascy Consp. Fl. Gr. 3:264 (1910); Hayek, Prodr. Fl. pen. Balc. 3:86 (1933).

ICON. Guss. Ic. Fl. Sic. t. 178 (sub *Hyacintho*).

SYN. *Hyacinthus dubius* Guss. Cat. Pl. Boccad. 32 et 78 (1821); Baker Linn. Proc. 11:432 (excl. syn. *B. Webbiana* Parl.); Fiori Nuov. Fl. anal. d'Italia 1:261. — *B. Gussoneana* Griseb. Fl. Rumel. 2:387 (1844).

15-40 cm. Bulb small or medium (1.5-2.5 cm.). Leaves 2-5, longer than scape, rarely as long, strap-shaped, canaliculate, prostrate, with glabrous margin; outer leaf 4-13 mm. (generally less than 1 cm. broad). Flowering raceme cylindrical, 10-30-flowered, 3-(7)-9 cm. long, 2-2.5 cm. broad. Flowering pedicels erect-patulous to horizontal (while the flowers sometimes nodding), shorter than flower or sometimes as long; fruiting pedicels erect-patulous or horizontal, shorter than pod or about as long. Perigonium campanulate, 5.5-8 mm. long, light-blue in bud, light-violet from base to 2/3 of its length or dark-greenish during anthesis; lobes whitish, green-nerved, triangular-ovate, about one third as long as tube. Anthers blue. Fruiting raceme cylindrical, 2.5-3 cm. broad. Valves of capsule obovate, 7-10 x 7-10 mm. Seed globular, ca. 2 mm.—March-Apr.

Described from Palermo (Sicily). — In mountainous meadows and on cultivated soil.—Geogr. area: S. Italy, Sicily, Dalmatia, Albania, Greece, Portugal, Crete (after Baker).—West-Mediterranean species.

ssp. *typica* ssp. nov.

Plantae Siciliae et Italiae Merid. Folia 3-5, 6-13 mm. lata. Perigonium 6,5-(7,25)-8 mm. longum.

Specimens seen: ITALY: Sicilia: In herbis montosis Panormis (1825 Gussone HD); e Sicilia (1825 Gussone HD); Palermo a San Martino (Gussone HR); Palermo ad Gracia (1836 Parlatore HF); Palermo a San Martino (No. 1212 Todaro HR); presso nella piana di Catania (Gussone HF); Girgenti a San Pietro (1900 Martelli HD); supra Bocca di Falco (1855 Huet du Pavillon HD HV HF); Girgenti ad Macalubbi (1873 HF); propre Panormum (Gasparini HG); colli presso Taormina (1895

Spencer HF); Porto Empedocle (1906 *Fiori* HF). Calabria: Fiumarella di Catanzaro (1883 *Fiori* HF); Giuriliano, prov. di Catanzaro (1884 *Fiori* HR).

ssp. *Boissieri* (Freyn) Feinbr. comb. nov.

SYN. *B. Boissieri* Freyn in *Flora* 68:95 (1885).

Plants of Dalmatia, Albania and Greece, of smaller size. Leaves 2-4, narrower, 5-8 mm. broad, rarely to 10 mm. Flower smaller, 5(-6.25)-7 mm. long. Specimens seen: DALMATIA: Lesina (1849 *Botteri* HV); Orebic (1930 *Bojko*). ALBANIA: (*Sanders* HV). GREECE: Cerigo (1894 *Makowsky* HV); Lewkas, Kalligoni (1929 *Just* HV); Zante (1837 HD); Corfu (1883 HF, 1903 HV); Corfu-Peleka (1902 *Halacsy et Sterneck* HP); in insula Corcyra prope Vorgpatades (1912 *Tunta* HF); prope urbem (1890 *Sagburg* HF; 1867 HF); Corfou (1901 *Barbey* HB); insula Idra; in mte. Prophet Elias Graenia (1876 *Pichler* HF); in insula Hydra (1876 *Heldreich* HF HP HV); in monte Malevo Laconiae (1857 *Orphanides* HV); in monte Boidias (Panachaikon veterum) supra Patras (1861 *Heldreich* HD).

ssp. *Hackeli* (Freyn) Feinbr. comb. nov.

SYN. *B. Hackeli* Freyn. in *Oester. Bot. Zeitschr.* 27:289 (1877).—

Hyacinthus dubius A.X.P. Coutinho *Fl. Port.* 136 (1913), non Guss.

Smaller plants, 20-22 cm. Leaves 2-(3-)5, 4-6 mm. broad. Flower 5-6.5 mm. long, dark-blue; lobes oblong, as long as tube and lightly coloured. Anthers violet. Pedicels of young pods nodding. Pod slightly retuse.

Area: S. Portugal. Villa Nova de Portimão, terrenos incultos (1889 *Moller* HV HR loc. clas.!).

In the following we discuss the taxonomic value of *B. Boissieri* and *B. Hackeli*, both described by FREYN.

In the differential diagnosis of *B. Boissieri* FREYN gives: "Orientalisch. Blueten kleiner, kuerzer und breiter glockig"; and for *B. dubia*: "Sizilisch". HALACSY (1904) regards *B. Boissieri* simply as synonym of *B. dubia*, because: "haec differentia meo sensu minimi momenti est, nam planta sicula saepe perigonis aequae parvis, ac graeca gaudet". We do not agree with this extreme view. Although the variation of the length of flower and the breadth of leaves of both forms is overlapping, every form has a maximum and medium size of its own, so that in the Balkan form the flowers do not reach 8 mm. in length and the leaves are less than 1 cm. in breadth. There is a complex of minor morphological characters, connected with special ecological requirements, which impose a separate area for this form. We therefore regard *B. Boissieri* as a subspecies.

B. Hackeli differs morphologically somewhat more from *B. dubia*. Besides quantitative differences there are qualitative ones in the colour of flower (after FREYN) and of anthers. We are not sure whether the different position of fruiting pedicels of our ssp. *Hackeli* specimen is constant. We do not regard, however, these differences sufficient for regarding this form as a separate species. The scant material collected till now is as yet insufficient. It seems that ssp. *Hackeli* is a rare plant. Its isolated area is very remarkable. Let us summarise the differences between the three forms of the species:

Characters	ssp. <i>typica</i>	ssp. <i>Boissieri</i>	ssp. <i>Hackeli</i>
Length of perigonium	6.5-(7.25)-8 mm.	5.5-(6.25)-7 mm.	6-7 mm.
Breadth of leaves	6-13 mm.	5-8 mm., rarely 10 mm.	4-6 mm.
Number of leaves	3-5	2-4	2-(3)-5
Area of distribution	Sicily and S. Italy	Dalmatia, Albania, Greece	S. Portugal
Size of plant	taller	lower	lower

The plants recorded under *B. dubia* from N. Africa belong to *B. variabilis*.

In Italy *B. dubia* was found chiefly in Sicily. From S. Italy there are only two records: from fields of Tupo E Santa Elia, S of Naples (*Baccarini* 1891) and from Ancona on the Adriatic coast. We do not know whether the last record pertains to ssp. *typica* or ssp. *Boissieri* which is found in Dalmatia on the opposite coast.

The disjunct area of *B. dubia* suggests its ancient age. It is chiefly a species of natural habitats.

4. *B. Webbiana* Parl.

Parl. Nuov. Gen. e Spec. 19 (1854); Arcangeli, Fl. It. 131 (1894); Freyn in Flora 68:93 (1885).

ICON. Christ e Caldesi Sulla *Bell. Webb.* Parl. Nuov. Giorn. Bot. Ital. 15 (1883), Tav. IX.

SYN. *Hyacinthus Webbianus* Nym. Syll. Suppl. 64 (1865); *Muscari comosum* × *Hyacinthus romanus* Caruel (1871); Fiori Nuov. Fl. an. d'Ital. 1:262 (nota) (1923-25); Fiori e Paoletti Fl. an. d'Ital. 1:191 (1896-98). — *B. dubia* Rchb.

25-60 cm. Bulb 2.5-3.5 cm. Leaves 3-4, generally longer than scape, strap-shaped, canaliculate below, erect, with glabrous margin; outer leaf 10-20 mm. (mostly 10-15 mm.) broad. Flowering raceme cylindrical, 20-50 flowered, the upper sterile, 7-12 cm. (mostly 8-9 cm.) long, 2-2.5 cm. broad. Flowering pedicels as long or somewhat longer (rarely somewhat shorter) than flower, almost erect before, nodding during and horizontal or nearly erect after anthesis. Perigonium tubular, short, 5-7 mm. long, light-violet in bud and reddish-grey during anthesis; lobes ovate, half as long as tube, connivent. Anthers violet. Fruiting raceme cylindrical, ca. 4 cm. broad. Fruiting pedicels horizontal, as long as pod. Capsule obcordate, 11 x 12 mm. Seed 3 x 3 mm. — April-May. $2n=8$.

Fields, roadsides and grassy places. — Geogr. area: N. Italy. — West-Mediterranean species.

Specimens seen: ITALY: Toscana: Nei Prati a Vingone, Firenze (1910 Baccarini et Pampanini HF); All' Olmo (1928 Corradi HF); Inter cerealia in agro prope Villam Antinori ("alle Rose") ad meridiem Florentiae (1886 Levier HD HV); Florentiae, in campis satis prope Sosum (1863 Caruel HF); inter segetes Villa Rosae prope Florentiam (1874 HF); alla Madonna del Sasso (1875 HF); Dintro Fiesole nei campi (1871 HF); prope pagum Pratolino (HF); Florentiae (HR); Certosa, Florence (1877 W. Barbey HD); inter segetes villae "alle Rose" ad meridiem Florentiae abunde (1874 HR); alle Rose in agro Florentino (April 1880 HV); Mont Senaris près Florence (HB); Collina di Faenza (1872 Caldesi HR); Faenza (1875 Caldesi HR).

This species was regarded differently by various authors. CARUEL and also CHRIST and CALDESI (1883) held it for a hybrid of *B. romana* and *Muscari comosum*, probably on the ground of the occurrence of *B. romana* in the habitats of this plant and because of its sterile flowers reminiscent of *M. comosum*. FIORI and PAOLETTI (1896-98) and FIORI (1923-25) accept this view; the latter author even records this species as a hybrid in a footnote only.

We do not accept this opinion both from the theoretical point of view and for the reason of facts. After a geographical-taxonomical conception, every natural form, with a definite natural area of its own, whether hybrid or not, is a separate systematic unit, if it be a species or variety, etc. In the case of *B. Webbiana*, however, there is no evidence of its being of hybrid origin, especially not a hybrid between *B. romana* and *M. comosum*. Cytological evidence is against this assumption. After TISCHLER (1931) *B. romana* and *B. Webbiana* have 8 (2n) chromosomes, while *M. comosum* has 18(2n) chromosomes.

Various authors have confused *B. Webbiana* with *B. dubia*. REICHENBACH (1833) records *B. dubia* from N. Italy, where this species does not occur. BAKER reports *B. Webbiana* as synonym of *B. dubia*. These two species are, however, clearly different, as already stated by FREYN (1885). The differences, morphological, ecological and geographical are given in the following table.

Characters	<i>B. Webbiana</i>	<i>B. dubia</i>
Area of distribution	N. Italy (endemic)	Sicily, S. Italy, Greece, Dalmatia, etc.
Size of plant	35-40 cm. in average	20-25 cm. in average
Flowering raceme	longer (10 cm. or more)	shorter (less than 10 cm.)
Leaves	erect, 10-20 mm. broad	prostrate, 4-13 mm. broad
Flowering pedicels	mostly as long as flower or longer	mostly shorter than flower
Colour of perigonium	before anthesis light-violet, then reddish-grey	before anthesis light-blue, then greenish-violet
Shape of perigonium	broader at base	narrower at base
Size of perigonium	5-7 mm.	in Italy 6.5-8 mm.

5. *B. Lipskyi* (Misch.) Wulff.

Wulff, Fl. Taurica I, 3:56 (1930).

SYN. *Hyacinthus Lipskyi* Misch. in Arb. Kuban. Landwirtsch. Inst. 5:153 (1927).

15-35 cm. Bulb small. Leaves 2-(3)-4, strap-shaped, recurved, canaliculate, longer than scape, somewhat undulate, scabrous at margin and sometimes at nerves beneath; outer leaf 6-12 mm. broad. Flowering raceme cylindrical, about 30-flowered, 6-15 cm. long, ca. 2 cm. broad. Flowering pedicels somewhat shorter than flower, first almost erect, then nodding. Bracts relatively large, the upper ones coloured. Upper flowers sterile, dirty-violet, the fertile ones tubular-campanulate, first dirty-violet, then dirty-yellowish, 5-7 mm. long; lobes broad-ligulate, $\frac{1}{2}$ - $\frac{1}{3}$ as long as tube. Anthers violet. Fruiting raceme cylindrical; fruiting pedicels horizontal, shorter than 1 cm. Capsule obovate, Geogr. area: Crimea.—East-Mediterranean species.

Described from Balaklava (Crimea). Type in Leningrad. — In fields.—Geogr. area: Crimea.—East-Mediterranean species.

Specimens seen: CRIMEA: Balaklava (1905 Busch HL); Baidar (1906 *Krishtofovich* HL).

This species was confused for *B. trifoliata* and *B. dubia*. It differs from the former in size of flower, in shape and breadth of its scabrous leaves; it differs from *B. dubia* and *B. Webbiana* in shape and colour of perigonium, in scabrous leaves and other minor characters.

The scabrous lower surface of leaves is a character which does not occur in any other species of *Bellevallia*, while it is on the contrary rather common in *Hyacinthella*.

Its small and rather isolated area of distribution as well as its secondary habitats suggest that this species is rather a vestige of a probably wider northern distribution of the sect. *Nutans* in the past.

6. *B. Clusiana* Griseb.

Griseb. Spicil. Fl. Rumel. 1:387 (1843).

ICON. Clus. hist. 1:180.

30-40 cm. Bulb 3 cm., very deep, edible (after GRISEBACH). Leaves 3-4, longer than scape, strap-shaped, flat, with scabridulous margin; outer leaf 7-12 mm. broad. Flowering raceme cylindrical, 20-40 flowered, with few sterile flowers at top, loose, 6-10 cm. long, 2-3 cm. broad. Flowering pedicels erect-patulous to horizontal, 1.5-2 times longer than flower. Sterile flowers violet or lilac, the fertile ones livid, campanulate, 4-6 mm. long; lobes ovate, erect-patulous, about as long as tube. Fruiting raceme cylindrical, 3-4 cm. long. Fruiting pedicels about 1.5 cm. long, erect-patulous to horizontal. Capsule ovate.—May.

Described from Bithynia (Asia Minor). — In fields.—Geogr. area: N. Asia Minor.—East-Mediterranean species.

Specimens seen: ASIA MINOR: Paphlagonia, Wilajet Kastambuli, Tossia, ad versuras prope Koesen (1892 *Sinten* No. 4013 HB HP HV); Sivas, champs de la plaine (1892 *Père Girard de Césaire* HB).

This species which BOISSIER regarded conspecific with *B. dubia*, is easily distinguished from it, as seen from the following table:

Characters	<i>B. Clusiana</i>	<i>B. dubia</i>
Length of perigonium	4-6 mm.	5.5-8 mm.
Length of flowering pedicels	much longer than flower, often twice as long	mostly shorter than flower
Size of plant	30-40 cm.	15-40 cm.
Margin of leaf	scabridulous	glabrous
Relative length of lobes	about as long as tube	$\frac{1}{3}$ as long as tube
Habitat	fields	meadows, sometimes cultivated soil
Geographical area	Northern Asia Minor	from Greece westward

The flowers of *B. Clusiana* are the smallest of the genus. Like *B. Lipskyi*, this species is one of the few *Bellevalliae* occurring on the shores of the Black Sea.

7. *B. Tauri* Feinbr. sp. nov.

ICON. Tab. nostra XVII, 4.

SYN. *Muscari Tauri* Siehe nomen in herb.

30-40 cm. Bulbus? Folia 4, scapo breviora, lorata vel lanceolata, margine scabrida vel glabra; folia exteriora ca 1 cm. lata. Racemus floriferus cylindricus, 30-60-florus, 8-10 cm. longus, 2-2.5 cm. latus. Pedicelli floriferi ante anthesin fere erecti, demum nutantes, florem aequantes; pedicelli fructiferi divaricati vel paulum reflexi?, 1 cm. longi. Perigonium campanulatum, 6-7 cm. longum, lividum? (in herbario sordide fuscum), lobi flavescenti viride-nervosi, ovati, acuti, $\frac{2}{3}$ longitudine tubi. Racemus fructiferus cylindricus, 15 cm. longus, 3 cm. latus. Capsula parva retusa.

Described from Asia Minor. Type in Vienna.—East-Mediterranean species.

Specimens seen: ASIA MINOR: Cilic. Taurus, 800 m. bei Akardja (1912 Siehe 54 HV type!).

This plant was designated by SIEHE as *Muscari Tauri* sp. nov. HAYEK determined it as *B. macrobotrys* Boiss. It differs, however, from *B. macrobotrys* by many characteristics, such as narrower leaves, shorter perigonium, shorter pedicels etc. — Morphologically it resembles the geographically distant *B. Webbia* from which it most probably differs by colour of flowers, which we cannot exactly know from dried specimens. It differs also from *B. dubia* by longer raceme and flowering pedicels, etc. It is noticeable that in size this plant more closely approaches the larger Italian specimens of *B. dubia* ssp. *typica*, than the Balkan ssp. *Boissieri* which is markedly smaller in size. It differs from *B. lutea* in larger size of the whole plant, glabrous or scabridulous leaf margin, relatively shorter pedicels (as long as flower and not 1.5-2 times longer) etc. From *B. Lipskyi* this plant differs by leaves which are non-scabrous and non-recurved and shorter than raceme.

8. *B. dichroa* Hausskn.

ex Bornm. Pl. Strauss., 107 (1908).

Bulb large, ovate. Leaves 3-4, oblong or lanceolate, nearly erect, glaucous, with ciliate margin, 1.5 cm. broad, 6-10 cm. long, somewhat shorter than the single scape. Flowering raceme rather loose, ovate-oblong, 12-18- (rarely 40) flowered, 3.5 cm. long, 2-3 cm. broad; fruiting raceme almost not elongating. Flowering pedicels first very short, then as long as flower, horizontal or reflexed, intensely violet. Bracts small, white or violet. Perigonium tubular-campanulate, gibbous at base, 8-9 mm. long, dark-violet at base, dirty-yellowish in upper half; lobes twice as long as tube, broadly oblong, obtuse, divergent. Filaments linear, 5-6 times longer than yellow anthers. Capsule?—April.

Described from Persia (env. of Sultanabad, Mowdere). — In mountains.— Geogr. area: Persia.—Irano-Turanian (Iranian) species.

Of this species we had, unfortunately, no specimens for examination.

9. *B. Aucheri* (Bak.) Feinbr. comb. nov.

syn. *Hyacinthus Aucheri* Baker in Lin. Proc. Botany, 11: 431 (1871); non *B. Aucheri* Los. in Fl. URSS 4: 401 (1935).

Leaves 3, sheathing the scape at base, fleshy-coriaceous, linear, 15-20 cm. long, 8.5-12.5 mm. broad, with glabrous margin. Scape stout, 8.5-11 cm. high. Flowering raceme dense, 20-25-flowered, 3.5 cm. long, 3-3.25 cm. broad. Bracts minute. Lower flowering pedicels nodding, 5.5-6.5 mm. long. Perigonium 13 mm. long, with ovate to lanceolate almost erect lobes, half as long as tube; mouth of perigonium 4 mm. broad. — May.

Described from Persia (Ispahan No. 5396 *Aucher-Eloy*).—Habitat? — Geogr. area: Persia. — Irano-Turanian (Iranian) species.

This species of BAKER is rather obscure. The original description was of a specimen numbered 5396 by AUCHER-ELOY from Ispahan (Persia). Two herbarium sheets of this number examined by us do not correspond at all to the description of BAKER, and could be determined as *B. glauca*. Also BOISSIER designates the sheets No. 5396 of AUCHER as *B. ciliata* var. *glauca*. It is true that the Exsiccata of AUCHER are often heterogeneous, as we had occasion to ascertain in the case of its No. 2118. The type specimen of BAKER is therefore indispensable in order to arrive at the true *B. Aucheri*. We classed it for the moment in sect. *Nutans* according to the length of the flowering pedicels and their nodding position, but the form of the fruiting raceme will decide whether it belongs to this section or to sect. *Conica*. — *B. Aucheri* of the Flora URSS differs in many points from the original description; also the synonym recorded (*B. ciliata* var. *stenophylla*) is erroneous.

10. *B. lutea* Bordz.

in Ucr. Bot. Rev. 3:50 (1926); Grossh. Fl. Cauc. 1: 232 (1928); Fl. URSS 4: 402 (1935).

15-18 cm. Leaves linear, about as long as scape, with ciliate margin. Flowering raceme oblong to ovate. Flowering pedicels nodding, 1.5-2 times longer than flower. Perigonium tubular, greenish-yellow, dried violet-livid, 6.5-7 mm.

long; lobes erect, ovate, somewhat shorter than tube. Filaments as long as or somewhat longer than anthers. Fruiting raceme? — April.

Described from E. Transcaucasia (Akhalkalaki, Dshawachetia). Type in Kiev, URSS. — On grassy dry slopes, at 1800 m. — Geogr. area: E. Transcaucasia. — Irano-Turanian (Iranian) species.

We have not seen this species. It is possible that it is morphologically near related to *B. Tauri*.

11. *B. Fomini* Wor.

in Bul. Jard. Bot. Princ. 26: 617 (1927); Grossh. Fl. Cauc. 1: 233 (1927); Fl. URSS 4: 402 (1935).

15-40 cm. Bulb 1.5-3 cm. in diameter. Leaves 3-5, lorate, as long as scape, with smooth or scabrous margin; outer leaf 1-2 cm. broad. Flowering raceme cylindrical, 3-12 cm. long, 2.5 cm. broad. Flowering pedicels as long as flower, nodding during flowering, then patulous to horizontal. Perigonium tubular-campanulate, 6-7 mm. long, in bud violet, during anthesis greyish-lilac with blackish ovate lobes, half as long as tube. Anthers yellow, as long as triangular filaments. Fruiting raceme cylindrical, about 15 cm. long, about 4 cm. broad. Fruiting pedicels horizontal and somewhat curved, 1 cm. long. Valves of capsule ovate. Seed ovate, 2 x 2.5 mm. — April-May. — $2n=8$.

Described from Peidjeli-bar, E. Transcaucasia. Type in Tiflis. — Dry slopes and steppes. — Geogr. area: E. Transcaucasia. — Irano-Turanian (Iranian) species.

Specimens seen: TRANSCAUCASIA: Azerbaidjan, distr. Baku, inter pasc. Kilanova et p. Gamizdar (1929 *Sachokia* HL); ibid. prov. Baku, distr. Saljany, steppa Mugan inter pag. Karadonly et custodium Alpaut (1928 *Prilipko* HL); ibid. steppa Mil, inter cimeterium Pej-Gambar et ruinas Uren-Kala (1928 *Prilipko* HL); ibid. steppa Mugan, inter Romanovka et Beljasuvar (1928 *Prilipko* HL); prov. Gandzha, distr. Agdam, steppa Karabach, inter pag. Aftalu et urbem Agdam (1928 *Prilipko* HL); guv. Baku, distr. Djevanshir, village Chardakhly (1913 *Grossheim* HL); ibid. village Gasanris (1913 *Grossheim* HL); distr. Shemakha, village Bayaty (1928 *Grossheim* et *Sachokia* HL).

The colour of flower and especially of its lobes make this species reminiscent of *Leopoldia*. No other species of *Bellevia* has similar dark lobes; but the shape of perigonium and the characters of seed are typical of *Bellevia*.

12. *B. mauritanica* Pomel.

Pomel Nuov. Mat. Fl. Atl. 255 (1874); Freyn in Flora 68: 23 (1885); Battandier et Trabut Fl. Alg. Monoc. 65 (1895).

SYN. *B. romana* var. *Mauretanica* Bonn. in Bonn. et Barr. Cat. Tun. 416; Dur. et Bar. Fl. Lib. 236.—*B. Battandieri* Freyn in Flora, 25 (1885).—*B. romana* var. *Battandieri* Dur. et Bar. Fl. Lib. 236.—*Hyacinthus mauritanicus* Dur. et Schinz. Fl. Afr. 5: 387 (1895).—*H. Battandieri* Dur. et Schinz. Consp. Fl. Afr. 5: 386.

30-40 cm. Bulb large, blackish. Leaves 3-5, lorate, canaliculate, erect, as long as or longer than scape, 1-2 cm. broad, minutely ciliate or scabrous at margin. Flowering raceme oblong cylindrical, 3-4 cm. broad, rather many-flowered. Flowering pedicels somewhat shorter than flower, patulous. Perigonium broadly tubular-campanulate, dusky-violet, 8-12 mm. long, 5-6 mm. broad; lobes greenish, oblong, somewhat shorter than to half as long as tube. Anthers violet, half as long as filament. Fruiting raceme cylindrical, pedicels patulous. Capsule 12-15 mm. long, generally with almost obcordate, retuse valves. Seeds globular. — March-May.

Described from Algeria. — Fields and marshes. — Geogr. area : Algeria, Tunisia, ?Cyrenaica. — South-Mediterranean species.

Specimens seen : ALGERIA : Dans les champs près d'Alger (1829 *Bové* HD HF); champs argileux du Sahel d'Alger (*Battandier* HJ); marais a Maison-Blanche (*Battandier* HJ); Barbarie, in arvis (*Desfontaines* HD).

We agree with *BATTANDIER* in that *B. Battandieri* Freyn, given as a special marshy form, cannot be held as constant, at least as seen from dried material. The differential characteristics given for it by *FREYN* such as length of lobes (only a third of the length of perigonium), length of pedicels (only 7-10 mm. and 12-14 mm.), shape of pod (round-ovate, rounded above and slightly notched) do not constitute any complex of linked characters; these characters fluctuate rather independently and are comprised within the limits of *B. mauritanica*. Nevertheless living plants from marshy habitats should be studied.

In this subsection, *B. mauritanica* is outstanding by its erect pedicels. It seems to be a species of secondary habitats growing on hardly permeable soils. Thus edaphically it probably reminds *B. trifoliata*, *B. macrobotrys* and *B. Warburgii*. — *B. mauritanica* is not recorded from Tripoli.

The data on this species from Egypt concern *B. alexandrina* which differs from it by white at last lurid perigonium, by longer flowering pedicels etc. From Cyrenaica we had no plants for comparison and could not decide whether the plants recorded by *DURAND* et *BARRATE* belong to *B. mauritanica* or to *B. alexandrina*.

SUBSECT. *ALBIFLORA*

13. *B. Warburgii* Feinbr. sp. nov.¹

ICON. Tab. nostra XVII, 2.

40-60 cm. Bulbus magnus (3-4 cm. diam.). Folia 3-6, lanceolatorata, canaliculata, erecta, lata (exteriores 2-3.5 cm), scapo subaequalia vel breviora, margine breviter ciliolata vel scabra. Racemus cylindricus, laxis, 25-70-florus, scapo aequilongus vel longior, fructiferus valde elongatus, 5-9 cm. latus, 12-35 cm. longus. Pedicelli sub anthesi nutantes, demum horizontales vel arcuato-patentes, subverticillati, flore paulo longiores, rare usque ad duplum vel plus longiores, fructiferi horizontales, paulum arcuati, 2.5-5 cm. longi. Perigonium tubuloso-campanula-

¹ Named after the late Prof. OTTO WARBURG, who suspected it to be a new species.

tum, 10-13 mm. longum, ante anthesin album, viride-nervosum, demum luridum; segmenta virentia late ovata, tubo 1.5-3-plo breviora. Antherae purpureo-violaceae vel lilacinae. Capsula trigona, valvis ovatis, acutis, 1 cm. longis vel paulo longioribus. Semen globosum magnum. — Mart. — $2n=16$.

Described from Palestine. — In fields. — Geogr. area: Palestine and probably Syria and Asiatic Turkey. — East-Mediterranean species.

Specimens seen: PALESTINE: Esdraelon Plain: Ein Harod (1923 *E HJ* type!); *ibid.* (1924 *E*, 1929 *F*, 1930 *FZ HJ*). Shefelah: betw. Ramleh and el Qubab (1937 *E HJ*). Judean Mts.: Env. of Deir Aban near Artuf (1924 *E HJ*); Artuf (1924 *D. Rabinovitch HR*); Kiryath Anavim (1931 *Amdursky HJ*). SYRIA: in agris, Aleppo (1865 *Hausskn. HV*)? TURKEY: Mardin (1867 *Hausskn. HV*)?; Cilicia (*Aucher-Eloy* No. 2118 p.p. *HF*)?

This species is one of the three of the subsection *Albiflora*; morphologically it is nearest to subsect. *Colorata*, especially to *B. macrobotrys*. The following characteristics are common to both species: form and number of leaves, size of the plant, the many-flowered raceme, length of flowering pedicels, degree of their nutation, and the green nerves of the perigonium. Both species occur only in cultivated fields and often grow together. On the other hand they differ in colour of flower-bud and flower, in size of lower, in degree of incurvature of fruiting pedicels, in form of valve of capsule etc. The species also differ caryologically. *B. macrobotrys* has $2n=8$, while *B. Warburgii* has $2n=16$.

14. *B. alexandrina* Feinbr. sp. nov.

ICON. Tab. nostra XVII, 5.

30-50 cm. Bulbus magnus (3-4 cm.) Folia 3-6, lanceolata vel lorata, lata (exteriora 2-3.5 cm., rare 1.5 cm.), inferne canaliculata, erecta, scapo aequilonga vel breviora, margine breviter ciliata vel scabra. Scapus tantum crassus, supra terram 20-35 cm. altus. Racemus cylindricus, latus, laxis, 25-40-florus, floriferus 5-25 cm. longus, ca. 5 cm. latus, scapo aequilongus, fructiferus 20-30 cm. longus. Pedicelli erecto-patentes, floriferi flori subaequilongi vel longiores, fructiferi paulum accrescentes, ca. 1.5-2 cm. longi. Perigonium tubuloso-campanulatum, 10-12 mm. longum, ante anthesin virente-album, in anthesin luridum; lobi ovati, tubo 1.5-3-plo breviores, loborum et tubi pars superior viride-nervosa. Antherae violaceae. Valvae capsulae ovatae, ca. 1 cm. longae. — Mart. April. — $2n=24$.

Described from Lower Egypt. — Sandy soil and probably fields. — Geogr. area: Lower Egypt. — South-Mediterranean species.

Specimens seen: EGYPT: grown from bulbs collected in Burj-el-Arab, Mariut, sandy soil (1935 *Shabetai HJ* type!); Mariut near Alexandria, (1890 *Schweinfurth HB*); in arvis prope Abukir (1844 *Figari HF*);

Mariout, in argillosis humidioribus (1880 *Letourneux* No. 307 HB HPr HV); Marioutte (1880 *Barbey* HD); Rosette (1904 *Muschler* HD).

Differs from *B. Warburgii* by erect-patulous (not nodding) flowering pedicels, by length of fruiting pedicels, by smaller raceme etc. The habitat of the species should be studied more precisely. It is the only hexaploid known in this genus, and is probably of hybrid origin.

15. *B. Elgii* Feinbr. sp. nov.

ICON. Tab. nostra XVII, 3.

20-30 cm. Bulbus magnus (3-4 cm.) Folia 3-6, lanceolata vel oblonga, lata (folia exteriora 2-4.5 cm.), paulum undulata, prostrata, scapo breviora vel subaequilonga, margine membranacea, \pm longe ciliata. Racemus 30-50-florus, floriferus cylindricus vel oblongus, 10-20 cm. longus, 5-6 cm. latus, terrae proximus; fructiferus cylindricus, 20 cm. longus, 8 cm. latus. Pedicelli floriferi erecto-patuli, flori aequilongi, fructiferi fere horizontales, ca. 3 cm. longi. Perigonium tubuloso-campanulatum, 10-14 mm. longum, ante anthesin albo-virens, demum luridum; lobi ovati viride-nervosi, nervibus prominentibus, tubo 2-3-plo breviores. Antherae violaceae. Valvae capsulae ovatae, 12-15 mm. longae, 11-13 mm. latae.—Mart.

Described from Palestine. — Steppes. — Geogr. area: S. Palestine. — Irano-Turanian (Mesopotamian) species.

Specimens seen: PALESTINE: Negeb: Betw. Beersheba and Asluj, sands (1936 EFZ HJ type!); Beersheba (1922 *Meyers et Dinsmore* No. 416 HDi); betw. Beersheba and Gaza (1911 *Meyers et Dinsmore* No. 447 HD HDi). Edom: Env. of 'Ain Musa (1936 EFZ HJ).

The species differs from the other two of this subsection by its oblong, prostrate and long-ciliate leaves, the almost sessile raceme, larger capsule, and its occurrence in primary habitats. With *B. alexandrina* it has in common erect-patulous, not nodding pedicels of about the same length. Cytological investigation of this species will reveal whether the whole subsection is polyploid¹.

SECT. CONICA

SUBSECT. ORIENTALIS

16. *B. ciliata* (Cyr.) Nees.

T. Nees v. Esenbeck Gen. Germ. 4 t. 8 (1833-37); Kunth Enum. 4: 308 (1843) p.p.; Boiss. Fl. Or. 5: 302 (1884) p.p.; Hal. Consp. Fl. Gr. 3: 263 (1904); Hayek Prodr. Fl. pen. Balc. 3: 85 (1933); Batt. et Trabut Fl. d'Alg. Monoc. 65 (1895).

ICON. Cyr. Pl. Rar. Nap. 2, t. 10.

¹ Note (during printing): A preliminary cytological examination of the species shows that it too is a polyploid.

SYN.¹ *Hyacinthus ciliatus* Cyr. Pl. Rar. Neap. 2: 23 (1788-92); Baker, Lin. Proc. 11: 432 p.p.; Fiori Nuov. Fl. Anal. d'Italia 1: 262 (1923-5).

30-50 (rarely 20) cm. Bulb large. Leaves 3-5, shorter than scape, lanceolate with membranous, densely long-ciliate margin; outer leaf 1.5-3 cm. broad. Scape thickish, about as long as raceme. Flowering raceme conical, many- (30-50)-flowered, loose, 10-12 cm. long, 6-10 cm. broad. Flowering pedicels thick, the lower ones 3 or more times longer than flowers, before anthesis patulous, then nodding. Perigonium campanulate, 9-11 mm. (rarely 8 mm.) long, lilac, lobes greenish, ovate, 2-3 times shorter than tube. Anthers purple. Fruiting raceme broadly-conical, 13-15 cm. long, 15-20 cm. broad. Fruiting pedicels rigid, horizontal, 7-10 cm. long. Capsule oblong, emarginate, attenuated at ends, generally 1.5 cm. (to 2 cm.) long. — March-April. — $2n=8$.

Fields and cultivated places. — Geogr. area: Turkey, Greece, S. Italy, Algeria. — Omni-Mediterranean species.

Specimens seen: TURKEY: In fruticetis collinis Smyrnae (1827 Fleisher HPr). GREECE: Thessalia, Larissa, in agris incultis versus Nehali (1927 Reehinger fil. No. 1132 HV); in collinis ad Thessalonicam (1903 Adamović HV); Attica, pr. Liosia ad radices m. Parnethis (1889 Heldreich HD HP HV); in arvis ins. Salaminis (1878 Heldreich HV); in monte Pateras, in arvis (1884 Heldreich HV); in agris inter Oropo et Chaleidem (1884 Heldreich HD HF HV); in insula Aegina (1881 Heldreich et Holzmann HV). ITALY: Apulia, Foggia (1856 Gussone HF); in cultus et Campis Apuliae (1848 Gasparini HF); Foggia (1918 Paoli HF). ALGERIA: Mascara (1884 Trabut et Battandier HR); Oran (Battandier HJ).

The history of the description of this species is of particular interest. The species was published by CYRILLUS (1788), by citing the whole original description of CLUSIUS. To this description CYRILLUS added a coloured plate, which, however, does not correspond to the description. The difference between them concerns (1) the colour of the flowers, which is lilac on the plate and "initio candicates deinde... fulci et inelegantis coloris" in the description; (2) the length of flowering pedicels which are very long on the plate, while given "initio brevissimi... deinde paulatim... excrecentes" in the description. The difference can be explained by the fact that CLUSIUS used for his description a plant from Constantinople. This, however, was different from the Italian plant which CYRILLUS probably represented on his plate. A single specimen from Constantinople examined by us, agrees with the description of CLUSIUS very well. CYRILLUS seems not to have paid attention to those differences. We therefore suppose that two species are here in question, but because of the lack of material we shall not distinguish between them for the present. According to the rules of nomenclature the name *B. ciliata* is to be retained for the depicted Italian plant.

¹ We could not verify the following synonyms given by BOISSIER: *Muscari ciliatum* Bot. Reg., *Hyacinthus patulus* Bertol., *Hyacinthus Olivieri* Bak.

BOISSIER viewed this species very broadly. Among the plants recorded by him under this name we could distinguish the following species: *B. ciliata* (Cyr.) Nees. from Greece, *B. longipes* Post from Cilicia (No. 2118 of AUCHER-ELYON p.p.), *B. macrobotrys* Boiss. (No. 106 of the Colonel CHESNEY), *B. sarmatica* (Pall.) Wor. from Crimea, *B. glauca* (Lindl.) Kth. (under var. *glauca*), *B. Saviczii* Wor. from S. Persia (under var. *stenophylla*) etc.

The true area of distribution of *B. ciliata* is much more restricted than given by BOISSIER and is somewhat disjunct. The plant seems to occur only in secondary habitats. The geographical-ecological features and some of the morphological characters of the species suggest that it is one of the most closely related plants to the ancient type of the section *Conica*.

According to ROUY (1910) this species is adventitious in S. France.

17. *B. longipes* Post.

Post in Bull. Herb. Boiss. 3: 165 (1895); Post Fl. 798 (1896); Post-Dins. 2: 651 (1933).

SYN. *B. ciliata* Boiss. Fl. Or. 5: 302 p.p. (Cilicia Auch. 2118 Exscc. p.p.); Kunth Enum. 4: 308 (1843) p.p.? *B. ciliata* Cyr. var. *paniculata* Post, Journ. Lin. Soc. Bot. 24: 440 (1888).

50-60 cm. (to 70-80 cm. in fruiting state). Bulb 2.5-3 cm. Leaves 3-4, ascending and recurved above, about as long as scape, lanceolate to lorate, canaliculate, blackish when dried; margin not ciliate, glabrous or scabrous; outer leaf 2-3.5 cm. broad. Scape thickish. Flowering raceme conical, 15-35 cm. long, loose, 20-45 flowered, generally destitute of sterile flowers. Pedicels first erect, then nodding, sometimes coloured; lower flowering pedicels 4 times or more as long as flower (4-9 cm. long). Perigonium campanulate, 9-13 mm. long, in bud purple, at the beginning of anthesis dirty-purple with paler lobes, then livescient; lobes ovate-oblong, as long as tube, rarely shorter. Fruiting raceme conical, 20-30 cm. broad at base. Fruiting pedicels rigid, thickish, horizontal or somewhat reflexed, the lower 9-15 cm. long. Capsule oblong, 17-23 mm. long, retuse at apex. Seed large (3.25 mm. in diameter). Fl. March, fr. April-May. — $2n=8$.

Described from N. Syria. Type in Beirut? — Fields. — Geogr. area: Palestine, Syria, S. Turkey, N. Iraq. — Irano-Turanian (Mesopotamian) species.

Specimens seen (partly in living state): PALESTINE: Shefelah: betw. Ramleh and el Qubab (1937 E HJ). Judean Mountains: Jerusalem (1930 Z HJ); betw. Kafr Netr and Jebel Qarantal (1930 Gabrieli HJ); env. of Deir Diwan (1930 FZ HJ). Esdraelon Plain: Yagur (1932 EFZ HJ); Ein Harod (1924 E, 1930 FZ HJ); Tel Joseph (1924 E HJ); Balfouria (1924 E HJ). Moab: W of Wadi Rumeimin 600 m. (1911 Meyers et Dinsmore, No. 1620 HB). SYRIA: Nusairy Mts., Hamdijeh (1885 Post, drawing, HB); Hauran, Sunamen (1896 Peyron No. 1741 HB); Jebel Druz, Azra (1931 Z HJ). Coelesyria, Citerne (1893 Peyron p.p. HD); Alep (1935 Gombault). TURKEY: Cilicia (*Aucher-Elyon* No. 2118 p.p. HD HF). N. IRAQ: 29 km S. of Khanaq, N. of Mosul;

Sulaimani plain, near Ali-Shan-Chai; betw. Ain Sattam and Imam Hamzah; Diana plain near Rowanduz (all 1933 EZ HJ).

The most outstanding characteristics of this species are the length of flowering and fruiting pedicels, the loose raceme, the long canaliculate leaves and their glabrous margin, which is remarkable within this section. The elongation of pedicels peculiar to this section is greatest in this species.

The species was reported from Palestine and Syria, but its area of distribution is much more extended. It is chiefly a segetal plant, generally appearing in abundance.

18. *B. trojana* Feinbr. sp. nov.

ICON. Tab. nostra XIX, 13.

15-25 cm. Bulbus parvus (ca. 1.5 cm.) tunicis bruneis. Folia 2-3 (rare 4), racemo breviora, lorata, 7-10 cm, longa, margine membranacea longe et dense ciliata; folia exteriora 12-15 mm. lata. Scapus tenuis, 8-15 cm. altus. Racemus floriferus conicus, pauciflorus, laxis. Pedicelli floriferi crassiusculi, nutantes, inferiores flore 1.75-2.75-plo longiores. Perigonium campanulatum, livescens (in herbario sordide fuscus), 8-10 mm. longum, lobi tubo 2-3-plo breviores. Antherae purpureae. Racemus fructiferus ignotus. Capsula ignota.—Maio.

Described from Troy (Asia Minor). Type in Geneva. — Grassy places.— Geogr. area: Turkey. — East-Mediterranean species.

Specimens seen: ASIA MINOR: Renkoei, in graminosis ad pagum Kassan-Oglu-Obam (1883 *Sintenis Iter trojanum* No. 63 HB HD HPr HV).

The nearest species seems to be *B. ciliata*, from which it is distinguished by smaller size of plant, shorter flowering pedicels, smaller and fewer flowers, narrower leaves, by habitat etc.

19. *B. araxina* Wor.

Wor. in Bull. Jard. Bot. Princ., 26: 614 (1927).

ICON. Fl. URSS 4: 399, t. XXIII, 6 (1935).

SYN. *Hyacinthus ciliatus* var. *grandiflorus* Bordz., in Scripta Soc. Nat. Kiev 25: 76 (1915).

40-50 cm. Bulb large (6 x 5 cm.). Leaves 4-7, glaucescent, lorate, shorter than fruiting scape, ciliate at margin, 16 cm. long, outer leaf 2.5-4 cm. broad. Scape thickish. Flowering raceme dense, many-flowered. Flowering pedicels arcuately nodding, the lower ones 2-3 times longer than flower. Perigonium campanulate, 11-12 mm. long, in bud violet, then lurid with paler, green-nerved, ovate lobes, half as long as tube. Style somewhat exerted. Anthers blue. Fruiting raceme broadly conical, ca. 20 cm. broad at base. Fruiting pedicels horizontal, rigid, the lower ones 7-9 cm. long. Capsule oblong, retuse at apex, 15-18 mm. long. Seed ovoid, 2.25-2.50 x 2.75-3.25 mm. — April-May.

Described from specimens grown from bulbs collected in Nakhichevan (Transcaucasia). Type in Tiflis. — Slopes. — Geogr. area: Transcaucasia. — Irano-Turanian (Iranian) species.

Specimens seen: S. TRANSCAUCASIA: Armenia: Nachitshevan (1923 Grossheim HJ authent. spec.); distr. Stihmiadzin, in Mte Mager 4500' (1922 Grossheim HL).

The nearest species is *B. longistyla* (see discussion below).

20. *B. longistyla* (Misch.) Grossh.

Grossh. Fl. Cauc. 1: 234 (1928); Fl. URSS, 4: 401 (1935).

SYN. *Hyacinthus longistylus* Misch. in Acta Inst. Agr. Kub. 5: 157 (1927).

Bulb large (4 cm.). Leaves lanceolate, up to 30 cm. long, 2 cm. broad; margin glabrous or ciliolate. Flowering raceme oblong, 15-25-flowered, with sterile flowers at top. Flowering pedicels as long as flower, erect or curved, at length nodding; fruiting pedicels horizontal, the lower ones 5 cm. long. Perigonium long-campanulate, 12 mm. long, in dried specimens reddish-purple; lobes acutish, straight, pale, 2-3 times shorter than tube. Style somewhat exerted. Fruiting raceme conical. Capsule large, ovate. Seeds 1-2 in a cell. — April.

Described from S. Transcaucasia. Type in Tiflis. — Valleys, fields. — Geogr. area: S. Transcaucasia and Persia. — Irano-Turanian (Iranian) species.

It is not yet clear whether *B. longistyla* and *B. araxina* are different species. WORONOW, who described the latter, did not see *B. longistyla*; GROSSHEIM mentions *B. araxina* as a synonym of *B. longistyla*. In the Flora URSS both species are given independently. According to it the differences between these species can be tabulated as follows:

Characters	<i>B. longistyla</i>	<i>B. araxina</i>
Length of leaves	30 cm.	16 cm.
Breadth of leaves	2 cm.	2.5-4 cm.
Number of flowers	15-25	numerous (40-60).
Length of flowering pedicels	as long as flower (12 mm.)	2-3 times longer than flower (22-35 mm.)
Flowering pedicels	erect or nodding	arcuately nodding
Length of fruiting pedicels	5 cm.	8-9 cm. (authentic specimen).

We have had for examination two authentic specimens of *B. araxina* in fruit and one flowering specimen (from Nachrespublica, pr. st. viae ferr. Dzulfu), determined by GROSSHEIM as *B. longistyla*. This last specimen conforms with the description of MISZENCO in breadth of leaves and number of flowers, but corresponds rather to *B. araxina* in form and length of flowering pedicels.

It is possible that *B. longistyla* and *B. araxina* are but one species. In that case the name *B. longistyla* would be valid, according to the rules of botanical nomenclature. Examination of the type specimen of *B. longistyla* is necessary for the elucidation of this point.

21. *B. sarmatica* (Pall.) Wor.

Wor. in Bull. Jard. Bot. Princ. 26 : 615 (1927); Grossh. Fl. Cauc. 1 : 235 (1928); Wulff Fl. Taur. I, 3 : 57 (1930); Fl. URSS 4 : 397 (1935).

ICON. Fl. URSS. 4 : 399, tab. XXIII, 3 (1935).

SYN. *Hyacinthus sarmaticus* Pall. Enum. Taur. in Nov. Acta Acad. Petrop. 10 : 595 (1795); Misczenko Arbeit. Kuban. Landw. Inst. 5 : 155 (1927). — *B. ciliata* Boiss. Fl. Or. 5 : 302 (1884) p.p. — *B. ciliata* Kunth Enum. 4 : 308 (1843) p.p. — *H. ciliatus* Cyr. Bak. Lin. Proc. 11 : 433 p.p.

25-50 cm. Bulb 2-4 cm. Leaves 3-7, much shorter than flowering scape, lorate, ciliate, 12-20 cm. long; outer leaf 12-27 mm. broad. Scape thickish. Flowering raceme ovate-oblong, many-(40-80-) flowered, 10-15 cm. long, 5-8 cm. broad. Flowering pedicels erect-patulous, sometimes nodding, the upper ones generally purple; the lower ones 4-8 times longer than flower. Perigonium campanulate, with broad base, 7-9 mm. long, dirty-lilac, turning greyish-brown, lobes whitish-yellowish, erect, ovate-oblong, one third as long as tube. Anthers violet. Fruiting raceme broadly conical, 18-25 cm. broad at base. Fruiting pedicels horizontal, the lower ones 7-12 cm. long. Capsule oblong, retuse at apex, 10-14 mm. long. Seeds 2-6 in a cell, 2-2.5 x 2.5-3 mm. — April-June.

Described from Crimea. — Steppes and dry hills. — Geogr. area: Bessarabia, S. Russia, Crimea, N. Caucasus. — Irano-Turanian (Sarmatic) species.

Specimens seen (among them several authentic): S. RUSSIA: Nowo-Tscherkask (1856 *Pabo* HT; 1889 *Paczoski* HL); Kaczkarowka guv. Cherson (1888 *Paczoski* HL); Ustnowinsk (1867 *Becker* HL); Distr. Mariupol, p. Czerdakly (1926 *Kleopov* HBr); Nikolayev (1895 *Theodoseyev* HT); Odessa (*Szowäts* HR); guv. Yekaterinoslav (1894 *Graff* HL; 1901 *Miram* HF HL HT); ibid. st. Nowokupolowka, in step. (1901 *Alexeenko* HL); guv. Kharkov, distr. Starobelsk (1910 *von Ettingen* HL). CRIMEA: Simferopol (1866 *Sredinsky* HL; 1886 *Zelenetsky* HB; 1900 *Callier* HD HP HR HT HV); env. of Theodosia (1905 *Busch* HT; 1911 *Saradinaki* HL); Kirleut Yarilgach, fallow field (1923 *Dzevanovsky* HL); pr. Taganrog (1847 *Turcz.* HD); Eupatoria, pag. Kizil-Chonrav (1930 *Tsyryna* HL); Chuchel, above Kozmodemian (1914 *Gribovsky* HL). N. CAUCASUS: Stavropol (1881 *Norman* HL); Sultanovskoye (1889 *Akinfiyev* HL); 15 km SE of Beshnagir (1915 *Turkewicz* HL); prov. Kuban (1908 *Busch* HL); Yeysk prov. Kuban (1890 *Lipski* HL; 1926 *Schiffers* et *Sokolova* HL); Castell Belevskaya (1774 *Fischer* HL), etc.

This species was confused by BOISSIER and others with *B. ciliata*, from which it can be easily distinguished as follows:

Characters	<i>B. sarmatica</i>	<i>B. ciliata</i>
Length of perigonium	7-9 mm.	9-11 mm., rarely 8 mm.
Colour of perigonium	dirty-lilac	lilac
Colour of lobes of perigonium	whitish-yellowish	greenish
Flowering pedicels	erect-patulous	nodding
Length of flowering pedicels	4-8 times longer than flower	3 or more times longer than flower
Habitat	steppes and dry hills	fields
Area of distribution	S. Russia, Crimea, N. Caucasus	Algeria, S. Italy, Greece, etc.

In disagreement with MISCZENKO WORONOW (1927) emphasises that this species does not extend E of Stavropol; it avoids saline soils.

22. *B. gracilis* Feinbr. sp. nov.

ICON. Tab. nostra XIX, 14.

25-40 cm. Bulbus 3 cm. in diam. Folia 2-3, lanceolata vel laterata, scapo ad basi cingentia, breviora, margine ciliolata, 10-20 cm. longa, 27-32 mm. lata. Racemus floriferus ovato-conicus, 20-30-florus, scapo multo brevior. Pedicelli primo erecti, denique nutantes, inferiori flore 1.5-2.5-plo longiores. Perigonium tubuloso-campanulatum, 6-7.5mm. longum, in herbario pallide luridum; lobi ovati, tubo circa duplo breviores. Capsula ignota. — Apr.-Maio.

Described from Anatolia. Type in Geneva. — Fields on high plateau, about 1000-1250 m. — Geogr. area: Turkey. — Irano-Turanian (Iranian) species.

Specimens seen: TURKEY: Anatolia, Sivas, champs de la plaine (1851, 1852 *Père Girard de Césarée* HB type!); Kurd Dagħ (1892 *Post* HB).

We class this plant into the subsection *Orientalis*, although from dried specimens alone it is difficult to recognise with certainty the colour of the flowers and the flower buds.

Its most important characteristics are: broad leaves, rather tall scape, small flowers, relative length of the flowering pedicels.

It differs from the small flowered *B. albana* in its longer and broader leaves and shorter pedicels; from *B. speciosa* by its shorter pedicels, and by the few-flowered and shorter raceme etc.

23. *B. albana* Wor.

Wor. in Bull. Jard. Bot. Princ. 26:615 (1927); Fl. URSS 4: 397 (1935).

ICON. Fl. URSS 4: 399, tab. XXIII, 5 (1935).

SYN. *Hyacinthus glaucus* Misch. in Acta Inst. Agr. Kuban. 5: 155 (1927), p.p. non Bak. — *B. Wilhelmsii* (Stev.) Wor. var. *albana* (Wor.) Grossh. Fl. Cauc. 1: 235 (1928). — *B. makuensis* Wor. in Grossh. Fl. Cauc. 1: 234 (1928).

15-30 cm. Bulb 2-3.5 cm. Leaves 3-4, lanceolate, glaucous above, ciliate, 10-14 cm. long, much shorter than scape, outer leaf 12-20 mm. broad. Scape 2-3 mm. thick. Flowering raceme conical, small, loose, 30-40 flowered, 6-10 cm. long, 5-7 cm. broad. Flowering pedicels thin, nodding, then patulous or divaricate, the lower ones thrice as long as flower or longer (2-2.5 cm.). Perigonium tubular-campanulate, 6.5-8 mm. long, in bud yellowish-violet, then dusky-brown, lobes green-nerved, ovate, 2.5 times shorter than tube. Anthers violet. Fruiting raceme broadly conical, 20 cm. long, ca. 15 cm. broad at base. Fruiting pedicels reaching 6 cm. in length. Capsule oblong, retuse at apex, ca. 15 mm. long. Seed ovoid, 1.75-2 x 2.5-2.75 mm. — May-July.

Described from a specimen grown from bulbs collected in Adzhikabul (Transcaucasia). Type in Tiflis. — Dry slopes. — Geogr. area: Transcaucasia, Turkey. — Irano-Turanian (Iranian) species.

Specimens seen: TRANSCAUCASIA: Azerbajdzahn, distr. Shemacha inter pagos Kushshy et Kalamadyn (1928 *Sachokia* HL). Armenia: Erivan, inter Aidallar et Schor-Bulakh (1931 *Tamamshian* et *Malejev* HL). Somchetia: Achatala, Tschamluk (1888 *Conarth* No. 103 HGr). TURKEY: Galatia, Amassia (*Menissadjian* No. 1098 HB).¹

This species differs from the nearest *B. glauca* chiefly by its relatively longer flowering and fruiting pedicels, by a more loose and broad raceme (see also discussion on *B. glauca*).

From the examination of a specimen determined by Russian botanists as *B. makuensis* Wor., we conclude that *B. makuensis* is synonymous with *B. albana* Wor., although the mentioned specimen differs from the latter by its somewhat smaller flowers.

24. *B. glauca* (Lindl.) Kth.

Kunth, Enum. 4: 309 (1843).

ICON. Lindl. Bot. Reg. t. 1085 (1828 vel 1829); reproduced in our Pl. XIX, 15.

SYN. *Muscari glaucum* Lindl. l.c.; Roem. et Schult. System. 7: 1709 (1830). — *B. ciliata* var. *glaucum* Boiss. Fl. Or. 5: 302 p.p.

25-35 cm. Bulb 3-4 cm. Leaves 5-6, glaucous, suberect, lanceolate to oblong, abruptly narrowing at the ground, shorter than flowering raceme, 15-17.5

¹ Somewhat differing from the Transcaucasian plants.

cm. long, ciliate; outer leaf 12-25 mm. broad. Scape rather thick, ca. 15-30 cm. long. Flowering raceme conical or oblong-ovate, dense, 25-60 flowered, usually longer than the lower portion of the scape. Flowering pedicels rather thick, patulous before anthesis, arcuate-nodding during anthesis, the lower ones 1.5-2 times longer than flower. Perigonium turbinate, 6.5-9 mm. long, purplish in bud, during anthesis purplish-green with white, green-nerved lobes; lobes oblong-ovate, about half as long as tube, semipatulous. Anthers blue or lilac. Fruiting raceme conical, longer than broad, 10-15 cm. long, 9-10 cm. broad. Fruiting pedicels patulous, the lower ones 4-5 cm. long. Capsule obovate, retuse at apex, 10-14 mm. long. Seed ellipsoid, 2×2.5 mm. — April-June.

Described from mountains of Persia. — Rocky places in mountains and steppes. — Geogr. area: Transcaucasia?; Persia; N. Iraq. — Irano-Turanian (Iranian) species.

Specimens seen: PERSIA: Ispahan (*Aucher-Eloy* No. 5396 HD HF). Talpan, naechst Hamadan (1882 *Pichler* No. 98 HB). Elwend (Media), supra Gendjuame (1882 *Pichler* HB HV); inter segetes Aderbidjan (*Aucher-Eloy* No. 5395 HD)? N. IRAQ: Grown from bulbs collected NW of Tauq, 210 m.; 145 km NE of Deltawah 200 m.; 79 km. from Deltawah, near Jebel Hamrin; env. of Dohuk, 15 km S. of Khanaq (all 1933 *EZ HJ*). TRANSCAUCASIA: Kumyiskische Ebene (*Lagowski* HL)?

It is very difficult for the moment to form a clear picture about this species, especially in connection with the problem of its clear differentiation from the allied *B. albana* Wor., *B. Wilhelmsii* (Stev.) Wor. and *B. montana* Boiss. WORONOW (1927) emphasized that *B. glauca* is a Persian species, which does not occur in Transcaucasia, where it is replaced by two endemic species, *B. Wilhelmsii* and *B. albana*. The former should occur in the western, the latter in the eastern part of the valley of Kura river. Still WORONOW knew *B. glauca* only from the beautiful figure of LINDLEY, and *B. Wilhelmsii* and *B. montana* only from the herbarium (as other Russian botanists apparently). Neither did he give any differential characteristics for *B. glauca* on the one side and *B. Wilhelmsii*, *B. montana* and *B. albana* on the other. Moreover, the descriptions of these species as given by different Russian sources disagree (e.g. for *B. Wilhelmsii* the anthers are recorded as blue by GROSSHEIM and yellow by LOSINSKAYA; the perigonium 6-8 mm. long in authentic specimens of WORONOW and 8-10 mm. by LOSINSKAYA, etc.). The transcaucasian material at our disposal, partly determined as *B. Wilhelmsii* by WORONOW, and partly as *Hyacinthus glaucus* var. *montanus* by MISCZENKO, is rather heterogeneous, showing gradual transitions to *B. albana* and *B. glauca* on the one hand and to *B. montana* on the other. It seems therefore questionable whether the plants described as *B. Wilhelmsii* should be accorded a separate category. The solution of the whole question will be made possible only by a comparison of living material collected from the classical localities of all species referred to, and provided with notes on colour of buds, flowers and anthers.

In the following a synoptic table is given of some differences between the discussed species, as far as is known at present:

Characters	<i>B. glauca</i>	<i>B. Wilhelmii</i>	<i>B. montana</i>	<i>B. albana</i>
Size of plant	medium	medium	small	medium
Raceme	many-flowered, dense	many-flowered ¹	few-flowered	loose
Length of raceme	long	short?	short	shorter than in <i>B. glauca</i>
Length of flowering pedicels	1.5-2 times longer than flower	somewhat longer than flower	1.5 times longer than flower	3 or more times longer than flower
Length of perigonium	6.5-9 mm.	6-8 mm. (according to LOSINSKAYA 8-10 mm.)	5.5-7 mm.	6.5-8 mm.
Colour of flower bud	purplish	dirty-violet	sky-blue	dirty-violet
Colour of flower	purplish-green with white-green lobes	lurid with green-nerved lobes	blue turning lurid	lurid with green nerves
Breadth of leaf	12-25 mm.	25 mm.	10-15 mm.	12-20 mm.

¹ According to description, but not in the examined authentic specimen.

The Iranian plants from which we had also living material, seem to differ morphologically and ecologically from the Persian *B. glauca*. These plants probably constitute a separate variety or subspecies. For definite determination richer dried and living material from Persia is necessary.

25. *B. Wilhelmsii* (Stev.) Wor.

Wor. in Bull. Jard. Bot. Princ. 26 : 617 (1927); Grossh. Fl. Cauc. 1 : 234 (1928). Fl. URSS 4 : 403 (1935).

syn. *Muscari Wilhelmsii* Stev. in Bull. Soc. Nat. Mosc. 30 : 336 (1857). — *Bellevia glauca* auct. fl. cauc. p.p.

Bulb medium sized. Leaves 3-4, oblong-lanceolate, tapering at base, glaucous, 2.5 cm. broad, with scabrous or ciliolate margin. Flowering raceme many-flowered, the upper flowers sterile. Pedicels somewhat longer than flower, nodding during flowering, then arcuately spreading. Perigonium 6-8 mm. long, dirty-violet in bud turning lurid, green-nerved; lobes connivent, three times shorter than tube. Anthers blue? yellow? Fruiting raceme conical. Fruiting pedicels refracted, 5-6 times longer than capsule. Valves of capsule not retuse.— May. — $2n=8$.

Described from Georgia. — Dry hills and fields. — Geogr. area : Transcaucasia. — Irano-Turanian (Iranian) species.

We discussed the value of this species in connection with *B. glauca*.

26. *B. montana* (C. Koch) Boiss.

Boiss. Fl. Or. 5 : 304 (1884); Grossh. Fl. Cauc. 1 : 234 (1928); Fl. URSS 4 : 403 (1935).

syn. *Muscari montanum* C. Koch. in Linnaea 22 : 253 (1849). — *Hyacinthus glaucus* var. *montanus* Misch. in Acta Inst. Agr. Kuban. 5 : 156 (1927).

15 cm. Leaves 4-5, lanceolate to oblong, tapering to the base, shorter than scape, 1-1.5 cm. broad, margin ciliolate. Flowering raceme oblong, pedicels thin, nodding during anthesis, 1.5 times longer than flower; upper flowers globular, sterile. Perigonium tubular-campanulate, 5.5-7 mm. long, lobes sky-blue, tube shining; lobes ovate-oblong, half as long as tube. Anther sky-blue. Fruiting raceme? Capsule? — May.

Described from Transcaucasia (Lory, Schuragel). — Type in Berlin. — Mountainous meadows. — Geogr. area : Transcaucasia. — Irano-Turanian (Iranian) species.

From this species we had at our disposal no authentic material. The species is apparently characterised by small size of plant, by colour of flowers and buds and by narrow leaves. New collections of plants from the classical locality are indispensable for giving a clear notion about this species. (See also discussion on *B. glauca*.)

SUBSECT. *OCCIDENTALIS*

27. *B. Saviczii* Wor.

Wor. in Bull. Jard. Bot. Princ. 26 : 614 (1927); Fl. URSS 4 : 403 (1935).

SYN. *B. ciliata* var. *stenophylla* Boiss. Fl. Or. 5 : 302 (1884) et var. *glauca* Boiss. l.c. p.p. — *Hyacinthus ciliatus* var. *brevipedunculatus* Pamp. in herb. — *H. glaucus* Baker Lin. Proc. 11 : 433, exsic. — *H. ciliatus* B. Fedtsch. Rast. Turkest. 250 (1915) (non Cyr.) — *H. Saviczii* Vved. in Fedtschenko etc. Fl. Turkmen. 309 (1932).

15-40 cm. Bulb medium sized (2.5 cm.). Leaves 3-6, oblong-lanceolate, 15-25 cm. long, longer than scape, glaucous above, margin short-ciliate to scabrous, outer leaf 5-20 mm. broad. Raceme oblong-cylindrical or ovate, 15-30-flowered, loose. Lower flowering pedicels patulous, 1.5-2 times longer than flower. Perigonium campanulate, 7-10 mm. long, white, becoming greyish-brown during flowering, lobes widely opened, ovate, broad, 1.5-2 times shorter than tube. Anthers violet, 1.5 mm. long. Fruiting raceme conical, reaching 15 cm. in length and 12 cm. in breadth. Fruiting pedicels arcuately spreading, the lower ones 4-5 cm. long. Capsule obovate-oblong, retuse at apex, 10-12 mm. long. — March-April.

Described from specimens grown from bulbs collected in Kopeth-Dagh, 2600-3300 m. (mountainous Transcaspia). Type in Tiflis. — Geogr. area : Russian Middle Asia (Pamiro-Alai), Afghanistan, S. Persia. — Irano-Turanian (Iranian) species.

Specimens seen : TRANSCASPIA : Aschabad, in stepis arenosis argillosis ad Geok-tepe (1900 Bornmueller No. 36 HB HV). AFGHANISTAN : Badghis and valley Hari-Rud (1885 Aitchison No. 135 HB HF). S. PERSIA : ad Buschir (1893 Bornmueller No. 661 HB); in arenosis ins. Karek in sinu Persico (1842 Kotschy No. 23 HD HF HPr HV).

This species was described by WORONOW from the mountainous part of Transcaspia and was thought to be endemic there. However, the comparison of *B. Saviczii* with some specimens from Afghanistan and from Persia made us include in it the plants known as *B. ciliata* var. *stenophylla* Boiss. Although these specimens of KOTSCHY (No. 23) from S. Persia given by BOISSIER differ clearly from *B. Saviczii* by their smaller size (10-15 cm.) and narrower leaves (5-8 mm.), another specimen from S. Persia, collected by BORNMUELLER is very much like the typical *B. Saviczii*. The Afghanian specimens are intermediate in size. The most characteristic features of *B. Saviczii* common to all mentioned specimens, are the linear shape and the relative length of leaves. It is, however, not impossible, that others constant differences will be found on living material collected from different parts of the apparently disjunct geographical area of *B. Saviczii*.

The species is the easternmost of this section. Its position within the section remains to be clarified. For the moment we place it in the subsection *Occidentalis* because of the white colour of its flowers.

28. *B. speciosa* Wor.

Wor. in Bull. Jard. Bot. Princ. 26 : 613 (1927); Grossh. Fl. Cauc. 1 : 234 (1928); Fl. URSS 4 : 404 (1935).

ICON. Fl. URSS 4 : 399 tab. XXIII, 4 (1935).

SYN. *B. ciliata* Boiss. Fl. Or. 5 : 302 (1884) p.p. — *B. ciliata* Radde Mus. Cauc. 165 (1899) p.p., non *B. ciliata* (Cyr.) Nees. — *Hyacin-*

thus ciliatus var. *genuinus* Bordz. in Scripta Soc. Nat. Kiev 25 : 76 (1915).

30-40 cm. Bulb large (5 cm.). Leaves 4-6, glaucescent, shorter than scape, lorate or lanceolate, abruptly narrowed below the ground, 14-20 cm. long, broad (outer leaf 3-4 cm.), margin ciliate. Scape firm. Flowering raceme conical or broadly ovate, dense, many- (up to 100-) flowered. Pedicels erect before flowering, then nodding, at last horizontal or incurved; the lower ones three or more times longer than flower. Perigonium campanulate, 7-8 mm. long, its colour milky white in bud, during flowering turning lurid with yellowish-white erect lobes, half as long as tube. Anthers violet. Fruiting raceme broadly conical, 20-30 cm. long, ca. 20 cm. broad. Fruiting pedicels horizontal, the lower ones 8-10 cm. long. Capsule oblong?, retuse, 13-14 mm. long. Seed 2×1.75 mm. — May-June. — $2n=8$.

Described from plants grown from bulbs collected in Kars district (Transcaucasia). Type in Tiflis. — Dry slopes and fields. — Geogr. area: Transcaucasia. — Irano-Turanian (Iranian) species.

Specimens seen: TRANSCAUCASIA: env. of Alexandropol (1913 Ropp HL); inter Alexandropol et pagum Mastara Armeniae (1875 Radde No. 206 HL); Karsk Gub. Kagymat (1914 Turkevich No. 121 HL); bei Kodi zwischen Tiflis and Erivan (Lagowski HL; locus dubius).

The most important characteristics of this elegant species are breadth of leaves, small size and large number of flowers etc. Though it resembles *B. sarmatica*, by the large, many-flowered raceme and size of flowers, it differs from it in its broader leaves and its pedicels, nodding before and during flowering, and incurved after flowering.

29. *B. latifolia* Feinbr. sp. nov.

ICON. Tab. nostra XVIII, 9 et fig. 33.

20-30 cm. Bulbus 3.5 cm. in diam. Folia 5-7 (rare 3), 12-20 cm. longa, late-lanceolata vel elliptica inferne abrupte attenuata, prostrata, scapo multo breviora, margine dense et longe ciliata, folia exteriora 4-8 cm. (rare 2.5 cm.) lata. Scapus firmus. Racemus floriferus oblongus vel ovatus vel conicus, multiflorus, 4-7 cm. latus. Pedicelli primo erecto-patentes, sub anthesi nutantes, post anthesin ascendentes, iidem inferiores flore ca. 2-2.5-plo longiores. Perigonium tubuloso-campanulatum, 10-13 mm. longum, ante anthesin albo-virens nervibus crassis viridibus. tubo cito sordide fusco, lobis pallidis; lorum et tubi pars superior nervis viridibus crassis obsita; lobi ovati, tubo 2-2.5-plo breviores. Antherae dilute-lilacinae. Racemus fructiferus conicus, 13-16 cm. latus. Pedicelli fructiferi rigidi, horizontales vel paulo ascendentes, inferiori 6-5 cm. longi. Capsula oblonga, apice et basi attenuata, apice retusa, 17-18 mm. longa, ca. 1 cm. lata. — Mart.-Apr.

Described from N. Iraq. — Cultivated soil in the steppe. — Irano-Turanian (Mesopotamian) species.

Specimens seen: N. IRAQ: Betw. Mosul and Dohuk, 1000-1500' (1931 *Guest* HJ type!); env. of Tel-Kaif, NE of Mosul, ca. 330 m., barley field, steppe soil (1933 *EZ* HJ); 12 km NE of Kirkuk, 460 m., hill of soft soil (1933 *EZ* HJ); 145 km NE of Deltawah (N of Baghdad), 200 m., fallow field (1933 *EZ* HJ).

The most outstanding characteristics of this species are: breadth of leaves (the broadest within the genus), which are suddenly narrowed under the ground; white colour of flower buds, early becoming dusky-brown, long perigonium (10-13 cm.), nodding flowering pedicels and long fruiting pedicels.

30. *B. stepporum* Feinbr. sp. nov.

ICON. Tab. nostra XVIII, 6, 7 et fig. 30, 31, 32.

15-40 cm. Bulbus mediocris. Folia 3-6, lanceolata vel lorata, prostrata, scapo paulo breviora usque ad sublongiora, margine plus minusve longe ciliata, 12-25 cm. (supra terram) longa, folia exteriora 2-3 cm. lata. Scapi saepe 2-3. Racemus floriferus conicus vel oblongus vel ovatus, 25-50-florus, 7-15 cm. longus, basi 5-8 cm. latus, scapo longior; fructiferus conicus, basi 12-18 (rare 7.5) cm. latus. Pedicelli floriferi patentes, rare nutantes, inferiores flori aequilongi vel 1.5-2.5-plo longiores, demum horizontales, interdum arcuati; fructiferi 2.5-8 cm. longi. Perigonium tubuloso-campanulatum, latum, basi umbilicatum, 9-12 mm. longum, ante anthesin album, viride vel flavido-nervosum, rare pallide-lilacinum, sub anthesi primo albo-virens, deinde paulatim usque ad pallide griseo-fuscum commutans; lobi pallidi, ovati vel oblongi, tubo duplo breviores. Antherae lilacinae. Capsulae valvae oblongae vel obovatae, apice retusae basi cuneatae, 10-17 mm. longae. — Mart.-Apr.— $2n=16$.

Steppes and fields on steppe soil. — Syria and Palestine. — Irano-Turanian (Mesopotamian) species.

var. *typica* Feinbr. var. nov.

20-40 cm. Perigonium viride-nervosum, latum, post anthesin corrugatum, racemus densus, pedicelli floriferi saepe nutantes, flore 1.5-2.5 plo longiores. Capsula 15-17 mm. longa. Plantae Deserti Syriaci.

Specimens seen (partly in living state): EASTERN and NORTHERN SYRIA: grown from bulbs collected between Soukhne and Deir ez Zor (1931 *Z* HJ type!); env. of Aleppo, fields (1931 *Z* HJ); between Telejin and Abudhur (1931 *Z* HJ), S. of Aleppo (1931 *Z* HJ); betw. Karyatein and 'Ain el Wa'ul (1890 *Post* HB).

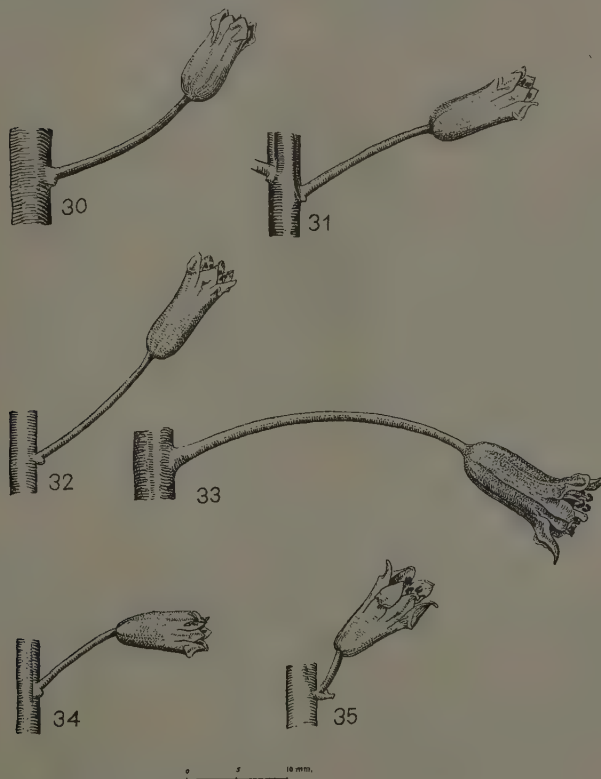
var. *transjordanica* Feinbr. var. nov.

20-40 cm. Perigonium angustior, nervis viridibus destitutum vel nervis pallide-flavidis obsitum, post anthesin non corrugatum. Racemus laxior. Plantae Palaestinae.

Specimens seen: PALESTINE: Moab: 2-3 km. S. of Ziza, in *Artemisietum Herbae albae* (1936 EFZ HJ type!); betw. Sahab and Kharana (1937 Dinsmore HJ); betw. El Muakkar and Kharana (1927 EFZ HJ).

var. *edumea* Feinbr. var. nov.

15-18 cm. Folia exteriora 3 cm. lata. Racemus floriferus ovatus, densus, floribus subverticillatis, ca. 8 cm. longus, ca. 6 cm. latus. Pedicelli breviores patuli, demum arcuati; floriferi flori subaequilongi usque 1.5-plo longiores, fructiferi 2.5-3 cm. longi. Perigonium viride-nervosum. Capsula 10-14 mm. longa. Plantae Syriae et Palaestinae.



LEGEND TO FIGS. 30-35.

LEGEND TO FIGS. 30-35.

- | | | | | |
|---------|-----------|---------------------|---------------------|----------------------------|
| Fig. 30 | Flower of | <i>B. stepporum</i> | Feinbr. | var. <i>typica</i> |
| " 31 | " | " | " | var. <i>edumea</i> |
| " 32 | " | " | " | var. <i>transjordanica</i> |
| " 33 | " | " | <i>B. latifolia</i> | Feinbr. |
| " 34 | " | " | <i>B. flexuosa</i> | Boiss. |
| " 35 | " | " | <i>B. Mosheovii</i> | Feinbr. |

Specimens seen: PALESTINE: Edom, 7 km E of 'Ain Musa (1936 EFZ HJ type!), grown from bulbs collected between 'Ain Musa and Ma'an (1929 EZ HJ).

Within this polymorphic species we distinguished three varieties. These may deserve higher rank, but transitional forms make it difficult to define them more clearly. Caryological investigation of the typical form proved it to be an allotetraploid, most probably of hybrid origin. Thus the polymorphism of the species may be connected with that fact. The species exhibits variations in the following characters: (1) size of plant; (2) length, breadth and shape of leaves; (3) length of flowering and fruiting pedicels, and consequently shape of raceme. The ecology of all the forms of the species is in general the same.

31. *B. palmyrensis* Feinbr. sp. nov.

ICON. Tab. nostra XVIII, 8.

15 cm. Bulbus parvus. Folia 2-4, linearia, canaliculata, angusta, racemo florifero et fructifero superantia, margine ciliata, 10-12 cm. longa, exteriora 7-15 mm., rare usque ad 20 mm. lata. Racemus floriferus conicus, laxis, apice saepe floribus sterilibus obsitus, 5-8 cm. longus, 5 cm. latus; flores fertiles 10-20. Pedicelli floriferi patentes vel horizontales, 11-15 mm. longi. Perigonium tubuloso-campanulatum, basi umbilicatum, 6-(7)-9 mm. longum, 3 mm. latum, album, sub anthesi colore fere non commutans, lobi lanceolati vel oblongi, tubo paulo breviores. Antherae violaceae, lobis multo breviores. Racemus fructiferus late-conicus, 5-6 cm. longus, 7-8 cm. latus; pedicelli horizontales vel paulo ascendentes, inferiores 2.5-3 cm. longi. Capsula basi cuneata, apice retusa, 9 mm. longa, 7 mm. lata. — Mart.-Apr.— $2n=16$.

Described from Eastern Syria. — Steppes. — Irano-Turanian (Mesopotamian) species.

Specimens seen: SYRIA: Palmyra (1931 Z HJ type!); Caesarea Citerne, (1893 Peyron HD p.p.); Damascus (1890 Peyron HD).

This plant differs from the allied *B. stepporum* chiefly by smaller size of plant, raceme and flower, almost unchanging white colour of perigonium which is destitute of green nerves, linear narrower leaves etc. It differs from *B. Zoharyi* by much looser, few-flowered non-sessile raceme, longer fruiting pedicels, etc.

32. *B. Zoharyi* Feinbr. sp. nov.

ICON. Tab. nostra XVIII, 10.

10-15 cm. Bulbus parvus vel mediocris (1.25-2.5 cm.). Folia 3-5, lanceolata vel lorata, prostrata, glauca, racemo longiora (supra terram 7-12 cm. longa), margine ciliata vel scabra, exteriora 5-20 mm. lata. Scapi 1-2, 3-9 cm. alti. Racemus floriferus parvus, ovatus vel oblongus, subsessilis, densus, 15-35-florus, 2-3.5 cm. latus, 4-6 cm. longus; fructiferus conicus, parvus (4-6 x 5-6 cm.). Pedicelli erecto-patuli, flore

subbreviores usque ad sublongiores, fructiferi horizontales vel arcuati, inferiores 1.5-2 cm. (rare 1 cm.) longi. Perigonium tubuloso-campanulatum, 8-11 mm. longum, ante anthesin album, sub anthesi cito griseofuscum; lobi tubo duplo breviores; tubus in herbario lobis pallidior. Capsula 8-13 mm. longa, 6-9 mm. lata. Semen ellipsoideum. — Mart.

Described from Palestine. — Steppes. — Geogr. area: Palestine. — Irano-Turanian (Mesopotamian) species.

ssp. *typica* Feinbr. ssp. nov.

Bulbus parvus. Capsulae valvae obovatae, apice emarginatae, 8-10 mm. longae.

PALESTINE: Judean Desert: grown from bulbs collected at the 25th km on the Jerusalem-Jericho road (type! HJ).

ssp. *pyricarpa* Feinbr. ssp. nov.

Bulbus major. Capsulae valvae pyriformae, vix emarginatae, 13 mm. longae, 8 mm. latae.

PALESTINE: Edom: Wadi el Hesa, ca 800 m. (1936 EFZ HJ type! flow. spec.); 9 km N of Aneze, hammad, 1050 m. (1936 EFZ HJ type! fruiting spec.); env. of el Hesa (1929 EZ HJ). Negeb: Kiesboden bei Hemme (1916 Range No. 40 sub *B. macrobotrys* HJ).

During flowering it is rather difficult to ascertain that this species belongs to sect. *Conica*. The most outstanding characteristics are the small size of plant, its sessile or almost sessile raceme, and the pale lurid colour of its perigonium. The species differs from *B. stepporum* by an almost sessile raceme, smaller size of plant, shorter fruiting pedicels etc.. It differs also from *B. palmyrensis* by the different form and colour of perigonium during anthesis, by relatively shorter lobes, denser and almost sessile raceme, generally larger flowers, geogr. distribution, etc.

SECT. *PATENS*

SUBSECT. *ROMANA*

33. *B. romana* (L.) Rehb.

Reichenb. Fl. Germ. exsc. 105 (1830); Kunth Enum. pl. 4: 307 (1843); Boiss. Fl. Or. 5: 301 (1884); Halac. Consp. Fl. Gr. 3: 264 (1904); Hayek Prod. Fl. pen. Balc. 3: 86 (1933).

ICON. Reich. Ic. t. 458 f. 1002; Nees v. Esenb. jun. Gen. 4 t. 8. f. 1-3. 6-21; Sibth. Fl. Graec. t. 340 (sub *Hyacintho*); Gawl. Bot. Mag. t. 939 (*Scilla romana*).

SYN. *Hyacinthus romanus* L. Mant 224 (1771); Willd. Sp. 2: 169; Bak. Linn. Proc. 11: 431 (1871); Fiori Nuov. Fl. An. d'Italia 1: 261 (1923-25); Rouy Fl. Fr. 12: 433 (1910). — *B. operculata* Lap. Journ. Phys. 67: 426 (1808). — *B. appendiculata* Lap. Abr. 186 (1818). — *B. cyanoleuca* St. Lag. (after the Ind. Kewensis).

20-40 cm. Bulb 1.5-3 cm. in diameter. Leaves 3-6, linear, canaliculate, as-

cending, longer than scape, with glabrous margin; outer leaf 5-15 mm. broad. Flowering raceme oblong, loose, 2-4 cm. broad, destitute of sterile flowers. Pedicels erect-patulous during and after flowering, nearly as long to twice as long as flower. Perigonium turbinate, 8-10 mm. long, white or slightly tinged with blue, turning lurid during flowering; lobes oblong-linear, acutish, as long or longer than tube. Anthers violet. Fruiting raceme cylindrical, pedicels erect-patulous, 10-15 mm. long. Valves of capsule elliptical, 10-15 mm. long. Seed large. — March-April. — $2n=8$.

Described from Rome. — Meadow, grassy places, fields and other segetal habitats. — Geogr. area: S. France, Corsica, Italy, Malta, Dalmatia, Greece. — West-Mediterranean species.

Some of the specimens seen: S. FRANCE: Lot. et Garonne, Villeneuve s. Lot., prairies humides a Montmais (1913 *Jeanjean* HD); prairies de Toulouse, de Carcassonne (1830 HV); prairies au bord de l'Hers (1890 *Fages* HB HF); Partiragnes, Hérault (1885 *Neyra* HB); in pratis circa Castelnau-dary, Aude (1885 HD); Var, La Crau d'Hyères (1889 *Albert* HD HP HV); plaines de la Garde, inondées l'hiver (1856 *Hueth* HF); l'Espagnol près d'Hyères, Var (1863 *Hueth* HD); Alpes maritimes (1867 *Camit* HD). Corsica: Prairies de l'étang de Biguglia (1867 HF HP HV). ITALY: Liguria: San Remo in varie vigne abbondante (1829 *Panizzi* HF); prope Genua (*Welden* HP). Lombardia: Prov. de Mantova (1883 *Magraguti* HF). Emilia: Parma (1854 *Passerini* HF); dintorni di Modena (1882 *Mori* HP HV); circa Mutinam (1877 *Ricci* HF); colline di Faenza (*Caldari* HR); M. Oliva (1912 *Pampanini* HF). Istria: Sicciole (1907 *Marchesetti* HF). Toscana: Fiesole (1936 *A. de Philippis* HJ); Florentiae, in pratis (1863 HLi); in pratis humidis Florentiae (1883 HG HP 1885 HV); Pisa, Arno (1882 *Evers* HG); prope Pisam (1810 *Savi* HD). Marche: Ancona (1928 *Fiori* HF HJ); S. Severino (1877 HF); Urbino (1917 *Funari* HF). Umbria: Spoleto (1885 *Corazza* HR). Rome: Campo Marzo (1857 *Braig* HV); Roma (1891 *Pappi* HD). Campania: Eboli (1812 HD; *Gunther* HV HBr); in bosco infer. di Portici, Neapoli (1912 *Pellanda* HBr HG).

In refutation of the data of KUNTH, BOISSIER and BAKER, this species does not occur in N. Africa. In Egypt there is even no species related to it, while in the western part of N. Africa *B. variabilis* is vicarious with *B. romana*. The data on the occurrence of *B. romana* in Cyprus are also erroneous. BOISSIER mentions a specimen of SIBTHORP with a remark: *Editione nondum vidi*. HOLMBOE records under *B. romana* two specimens of KOTSCHY. We ascertained that one of them (No. 93.216) is *B. nivalis*. Another specimen collected by LABILLARDIERE and determined as *B. romana*, differs clearly from that species (ciliate margin of leaves, very short pedicels) and may belong to a new species which, however, we could not describe for lack of sufficient material. The geographical area of *B. romana* does not extend eastward of Greece, where it seems to be less common than in Italy, centre of its area, where it occurs throughout the country. The absence of this species from Sardinia is worth noting.

The species occurs in different secondary and also primary habitats and

under different edaphic conditions, but avoids higher mountains (above 800-900 m.).

The relatively wide area of distribution of this species, its disjunct character (occurrence on islands as Sicily, Malta, etc.) the existence of a vicarious species (*B. variabilis*) in N. Africa, suggest the antiquity of *B. romana*. Some morphological characters of this species remind one of *Hyacinthus* or *Hyacinthella* (e.g. length of lobes of perigonium and their spreading, rounded ribs of capsule etc.). *B. romana* is probably the most ancient species of the Sect. *Patens*.

At this point it may prove useful to describe some characteristics which distinguish fruiting specimens of *B. romana* from those of *B. Webbiana*, which accompanies it in Italy and with which it is easily confused.

Characters	<i>B. romana</i>	<i>B. Webbiana</i>
Shape of valve of capsule	slightly or not at all retuse	manifestely retuse
Length of style	3 mm. or more	2 mm., style slightly projecting from the sinus
Fruiting pedicels	patulous	horizontal
Length of pedicels	usually longer	
Length of fruiting raceme	shorter	

34. *B. variabilis* Freyn.

in Flora 68: 29 (1885).

syn. *B. dubia* Batt. et Trabut, Fl. Alg. Monoc. 65; *Hyacinthus dubius* Dur. et Schinz Consp. Fl. Afr. 5: 387 (1895). — *Hyacinthus romanus* Desf. Fl. Atl. 1: 308 (1798) (non L.).

20-40 cm. Bulb medium or small. Leaves 2-4, usually 3, lorate, undulate, longer than scape, with smooth margin; outer leaf 4-9 mm. Flowering raceme ovate-elliptical or short-cylindrical, loose, 15-30-flowered, destitute of sterile flowers. Flowering pedicels at length horizontal, as long as or longer than flower (after FREYN only 4 mm. long). Bract conspicuous. Perigonium ovate-campanulate, broad at base, suddenly dilated under lobes, in herbarium lurid, 6.5-7 and 9 mm. long; lobes oblong, as long as tube. Anthers blue. Fruiting raceme cylindrical, pedicels horizontal, 1-1.5 cm. long. Capsule obovate, valves almost entire above, 15 mm. long. Seed ellipsoid, 3 x 3.25 mm. — Jan.-March.

Described from Oran (Algeria). — Among rocks and grasses. — Geogr. area: Algeria, Morocco. — West-Mediterranean species.

Specimen seen: ALGERIA: Oran (Pomel HJ); Oran, pentes rocheuses du fort St. Gregoire (1883 Debeaux HD; 1884 HF); Oran, versant rocailleux du Djebel-Santo (1882 Debeaux HB HF HV); Oran, Santa Crux (1884 Debeaux HV). MOROCCO: Dj. Habibi (1910-11 Gandoger HV).

In opposition to various Algerian authors, who held this species for *B. dubia* of another section, FREYN was doubtless right in considering it related to *B. romana*. In the following we give a table of distinguishing characters of *B. variabilis* and *B. romana*.

Characters	<i>B. variabilis</i>	<i>B. romana</i>
Area of distribution	N. African	European
Number of leaves	2-4	3-6
Breadth of leaves	generally narrower	5-15 mm.
Variability of length of perigonium	great	slight
Length of perigonium	6.5-7 mm. or 9 mm.	8-10 mm.
Shape of perigonium	ovate-campanulate broad at base, suddenly dilated under lobes	turbinate, narrow at base, gradually dilated
Pedicels	erect-patulous, then horizontal	erect-patulous

After FREYN small-flowered plants grow together with large-flowered ones. The matter should be examined in situ, in order to determine whether these are two separate forms, differing also in other characteristics.

The species grows chiefly in the coastal districts of Algeria and Morocco. After BATTANDIER, it occurs also in the Hauts-Plateaux.

35. *B. fallax* Pomel

Nuov. mat. Fl. Atlant. 254 (1874); Batt. et Trabut Fl. Alg. Monoc. 65 (1895).

SYN.: *Hyacinthus fallax* Dur. et Schinz Conspl. Fl. Afr. 5: 387 (1895).

20-30 cm. Bulb medium sized. Leaves 2-4, lorate with smooth margin, longer than scape, outer leaf 4-8 mm. broad. Flowering raceme cylindrical, dense, many-flowered, shorter than the free part of scape, ca. 3 cm. broad; bracts conspicuous, especially at the base of raceme; sterile flowers almost wanting. Flowering pedicels shorter than flower, erect-patulous; axis and pedicels blue. Perigonium tubular-campanulate, 7-10 mm. long, whitish within, outwardly blue at base, becoming pink or lilac-purple in upper part; outer lobes pink or lilac-purple; lobes ovate, half as long as tube. Anthers deep violet, filaments dilated, but not connected at base. Fruiting raceme cylindrical, narrow, pedicels erect-patulous, about 1 cm. long. Capsule rounded at base and retuse at apex. Seed globular. — Jan.-March.

Described from Algeria. — Rocks and sands near coast. — Geogr. area: Algeria, Morocco. — West-Mediterranean species.

Specimens seen: ALGERIA: Env. d'Oran, pelouses (1913, 1931, Faure HD); pelouse à Oran (1869 Warion HV); in rupestribus promontorii Falcon ad occid. urb. Oran (1934 Maire HJ).

It is rather difficult to distinguish this species from *B. variabilis* (apparently occurring in the same localities), especially in dried specimens. Both species should be compared in the living state. For the moment, the following distinguishing characters of *B. fallax* can be given: colour of perigonium (not exactly known for *B. variabilis*, but it seems to be lurid during flowering),

density of raceme with its numerous subverticillate flowers (raceme loose in *B. variabilis*), the always erect-patulous pedicels (in *B. variabilis* horizontal). The perigonium of *B. fallax* is somewhat papyraceous in herbarium, usually somewhat wrinkled, showing traces of the natural colour.

var. *maura* (Br.-Bl. et Maire) Feinbr. comb. nov.

SYN. *B. dubia* (Guss.) Kth. var. *maura* Br.-Bl. et Maire in Mém. Soc. Sci. Nat. Maroc. 8: 175 (1924). — *B. dubia* Rchb. f. *riphaeana* Pau in Font-Quer, Iter Maroc. No. 72 (1930).

A Moroccan plant, smaller in size (ca. 7-10 cm. above ground), perigonium shorter (7-8 mm.), colour?

Morocco: in arenosis maritimis c. Ixdain, Bocoia (1929 Font Quer HD).

36. *B. densiflora* Boiss.

Boiss. Diagn. Ser. I, 7: 109 (1846); Boiss. Fl. Or. 5: 304 (1884); Post Fl. 799 (1896); Post Fl. sec. ed. 2: 652 (1933).

SYN. *Hyacinthus densiflorus* Bak. Lin. Proc. 11: 432 (1871).

15-25 cm. Bulb small (1.5-2 cm.). Leaves 3-5, linear-lanceolate, attenuate, sometimes undulate, 12-25 cm. long, longer than scape, outer leaf 6-12 mm., margin smooth. Scapes 1-3, thin. Flowering raceme dense, first capitate to ovate-oblong, then oblong, spike-like, 2-5 cm. long, 1.5-2 cm. broad. Flowering pedicels erect, half as long as flower or shorter (2-3 mm., rarely 5-6 mm.), elongating after flowering till about 1.5 cm. Bracts relatively conspicuous. Perigonium campanulate, yellow (in herbarium yellowish, lobes darker than tube), 8-10 mm. long; lobes oblong to lanceolate, 1.5 times shorter than tube. Capsule? — April.

Described from Syria. — Type in Geneva. — Wet places. — Geogr. area: Syria. — Irano-Turanian (Mesopotamian) species.

Specimens seen: SYRIA: Syria Orientalis (*Aucher-Eloy* No. 2121 HD HF); in uliginosis p. pag. Kheilan, Aleppo (1865 *Hausknecht* HV); secus rivulos Mesopotamiae (1836 *Aucher-Eloy* No. 2675 HD); Antilibanon, Messaloun (1893 *Peyron* HD).

The characteristic features of this species are: (1) leaves longer than scape, (2) raceme dense, capitate or spike-like, (3) pedicels half as long as flower or shorter, erect and appressed, (4) perigonium 8-10 mm., (5) colour of perigonium and of anthers yellow. New collections of this species are desirable.

We are somewhat in doubt as to the plant described by Post (1890) as var. *longipes* of this species ("fleurs blanches, pedicelles plus longs que dans le type"); we had no opportunity to examine the original specimen.

37. *B. nivalis* Boiss. et Ky.

In Boiss. Diagn. Ser. II 4: 110 (1859); Boiss. Fl. Or. 5: 304 (1884); Post. Fl. sec. ed. 2: 652 (1933).

SYN. *Hyacinthus nivalis* Baker, Linn. Proc. 11: 430 (1871) p.p.; Holmboe, Veg. of Cyprus (1914) 51. — *H. Pieridis* Holmb. l.c. — *B. romana* et *Hyacinthus romanus* auct. fl. Cypri (non L.).

5-15 cm. Bulb 2-2.5 cm. in diameter. Leaves 4-5, lanceolate, longer than scape, undulate, with short-ciliate or scabrous margin; outer leaf 2-11 mm. broad. Scapes usually 2, thin. Flowering raceme cylindrical, almost spike-like, 8-15-flowered, 1 cm. broad, 2.5-4 cm. long. Flowering pedicels very short or 0, 1-(2-3)-5 mm. long, erect or slightly patulous. Bracts more or less conspicuous. Perigonium tubular-campanulate, 7-8 mm. long, colour pale, tube membranous and shining after flowering, paler than lobes. Anthers violet-purple. Fruiting raceme cylindrical, narrow, pedicels appressed almost not elongating, much shorter than capsule. Valves of capsule almost round, 5-6 mm. in diameter. Seed usually 1 in cell, ellipsoid, 2×3.25 mm. — May-June (Syria) or March-April (Cyprus).

Described from Manshura (Syria), 2150 m., near the snow. Type in Geneva. — Geogr. area: Syria, Cyprus. — East-Mediterranean species.

Specimens seen: SYRIA: ad nives alpium Manshura, 6500' (1855 Kotschy No. 58 HV); supra Bludan (1880 Peyron HD). CYPRUS: supra Prodro-mos in Troodos, 5000' (1859 Kotschy No. 411 HV); Redgelia (1880 Sintenis et Rigo HPa); ad Angoro inter Larnaca et Famagosta (1862 Kotschy 93.216 HV).

This species differs from the allied *B. flexuosa* chiefly in the length of flowering and fruiting pedicels, which are appressed to axis. From *B. densiflora* it differs in colour of anthers and size of perigonium. From *B. sessiliflora* and *B. desertorum* which it resembles by its short pedicels, it differs in various leaf and flower characters and the following characters of fruit: the fruit of *B. nivalis* is a true non-deciduous capsule opening at tip, that of the two last species is indehiscent and falls down as a unit.

The ecology of this species is somewhat puzzling. After BOISSIER it is a plant of the alpine mountain zone of Syria and Cyprus. But as we have shown elsewhere (p. 374) one of the plants of KOTSCHY from the coastal plain of Cyprus, given by him and HOLMBOE as *B. romana*, is a typical *B. nivalis*. Another puzzling fact is this: while the Syrian plant was collected flowering at May and June, that from Cyprus, both from the coast and from high mountains was collected in March and April. The flowering times of plants generally do not differ in Syria and Cyprus. Living material from both countries should be compared in regard of their phenology.

HOLMBOE (1914) described a new *Bellevalia* species from Cyprus under *Hyacinthus Pieridis* Holmb. He differentiates it from *B. nivalis* by some quantitative characteristics (such as: flowers 4-9 and not 15, breadth of leaves 2-5 mm. and not 4-11 mm. etc.), which in our opinion are within the limits of variability of *B. nivalis*. Besides, he also gives an ecological difference maintaining that the plant occurs on plains and not in high mountains. However, we have shown that *B. nivalis* occurs also in the coastal plain. We therefore regard *H. Pieridis* as synonymous with *B. nivalis* which is so far the only known Cyprian species of this genus.¹

¹ In case closer examination proves that the Cyprian plant is different from the Syrian *B. nivalis*, it should be described again and named *Bellevalia Pieridis* (Holmb.).

38. *B. flexuosa* Boiss.

Diagn. Ser. I 13 : 36 (1854); Boiss., Fl. Or. 5 : 303 (1884); Post Fl. 799 (1896); Post Fl. sec. ed. 2 : 652 (1933).

ICON. Tab. nostra XVIII, 11 et fig. 34.

SYN. *Hyacinthus paradoxus* Baker Lin. Proc. 11 : 432 (1871) (non Fisch. et Mey.).

10-50 cm. Bulb 1.25-2.5 cm. in diameter. Leaves 3-7, rarely 10, usually 4-5, linear-lanceolate, prostrate and somewhat undulate or erect and not undulate, usually longer than scape, with short-ciliate or scabrous margin; outer leaf 1-3 cm. (usually 1 cm.) broad. Scapes 1-4, 8-25 cm. long. Flowering raceme cylindrical, loose, 12-50 (usually 15-20)-flowered, 2.5-4 cm. broad, 3-12 cm. long, commonly as long as scape. Flowering pedicels generally shorter than flower, rarely as long or 1.5 times longer, often erect-patulous during flowering, sometimes with nodding flowers. Perigonium turbinate, 6-10 mm., usually 7-8 mm. long, white in bud (rarely slightly tinged with pink or lilac), with greenish nerve, soon turning lurid at flowering; lobes ovate, half as long as tube, with yellowish or greenish nerves. Anthers lilac or purple, as long as filament. Fruiting raceme cylindrical, short, 3-4 cm. broad, pedicels horizontal or sometimes erect-patulous, 8-15 mm. long. Valves of capsule round to ovate, 8-10 mm. long. Seed small, globular, 2 mm. — Febr.-March. — $2n=8$.

Described from Jerusalem. Type in Geneva? — Batha and grassy places. — Geogr. area : Palestine, Syria, Egypt. — East-Mediterranean species. Some of the specimens seen (partly in living state): PALESTINE : Shefela : Tel Aviv (1923 E HJ). Sharon : Hedera (1924 E HJ). Judean Mts : Jerusalem (1889 HV); Jerusalem (1924 Z HJ); Kiriath Anawim (1930 FZ HJ); Dahariyeh (1880 Barbey HD). Shomron : Zichron Jacob (1935 Sokolowich HA). Esdraelon Plain : Ein Harod (1922 E HJ). Up. Galilee : Kefar Gileadi (1925 Smoly HJ). Peki'in (1927 Smoly HJ). Up. Jordan Valley : Tiberias (1923 E HJ). Judean Desert : near Talat ed Dam (1931 EF HJ); betw. Tekoa and Ein Gedi (1926 Z HJ). EGYPT : pr. Alexandriam (1857 Samaritani HV); Mariout près Alexandria (1890, 1891 Schweinfurth No. 242 HB)? SYRIA : Mar Elias (1853 Blanche HV); Khaldé (1930 Gombault); entre Saida et Djoun (1934 Gombault); Sir, ca. 1800 m. (1933 Gombault).

The species is rather polymorphic and apparently comprises different ecotypes as yet insufficiently studied. Here we will only designate some variable characteristics of *B. flexuosa*, which sometimes make it resemble other species. (1) Leaves usually 1 cm. broad and prostrate, attaining 3 cm. in shady or grassy places and becoming erect, thus resembling *B. Warburgii*, from which it can be distinguished by the length of pedicels, fewer flowers, perigonium etc. (occurring chiefly in the Judean Mts.). (2) Pedicels usually shorter than flower reaching 10-15 mm. in fruiting raceme, may elongate till 2 cm., (as in the environs of Tiberias, near water). (3) Fruiting pedicels are generally horizontal. There is a form with incurved fruiting pedicels. (4) In drier places the free portion of the scape tends to become shorter. (5) Flowers are sometimes nodding resembling *B. trifoliata*. (6) In wet and warm conditions (for example in Upper Jordan Valley) the number of leaves reaches 10.

The typical habitats of *B. flexuosa* are E. Mediterranean associations especially of the Batha (as *Poterietum spinosi* and its different stages of destruction), where it is rather common. From these associations confined to "terra-rossa", it penetrates into steppe associations of the closely adjoining Irano-Turanian territory, with its different climatic and edaphic conditions (*Poterietum spinosi orientale*, *Noaetum mucronatae*, *Ononidetum Natricis*). Farther east *B. flexuosa* probably forms special ecotypes.

39. *B. Mosheovii*¹ Feinbr. sp. nov.

ICON. Tab. nostra XVIII, 12 et fig. 35.

14-20 cm. Bulbus mediocris vel parvus. Folia 2-(3-) 5, lorata vel lanceolata, scapo, 4-7 cm. longo, multo superantia, margine breviter ciliata, 10-15 cm. (supra terram) longa, folia exteriora 8-17 mm. lata. Scapus firmus. Racemus floriferus ovatus vel oblongus, densus, 20-30-florus, 3-4 cm. longus, 2.5 cm. latus. Pedicelli floriferi crassi flore breviores, 3-6 mm. longi, erecto-patuli vel horizontales, lilacini, bracteis parvulis suffulti. Perigonium tubulosum, basi latum, umbilicatum, 7-10 mm. longum, ante anthesin albo-caerulescens, demum pallide luridum, segmentis ovatis viride-nervosis, conniventibus, tubo duplo brevioribus. Antherae violaceae. Racemus fructiferus ovatus, 5 cm. longus, 4 cm. latus, pedicelli 7-8 mm. longi. Capsulae valvae ovatae, apice rotundatae, 9-11 mm. longae, 9-10 mm. latae. Semen magnum. — Mart.-April. — Hab. in steppis.

Geogr. area: Palestine and Syrian Desert as far as the Iraquian boundary.— Irano-Turanian (Mesopotamian) species.

Specimens seen (partly in living state): PALESTINE: Edom: grown from bulbs collected between 'Aneze and Ma'an, in an association of *Artemisia Herba alba* — *Anabasis articulata* (1936 EFZ HJ type!); 7 km E of Wadi Musa (1936 EFZ HJ); env. of Ma'an, 1050 m. (1936 EFZ HJ); Petra, rocky places, 1100 m. (1937 Dinsmore HJ). SYRIAN DESERT: 135 km E of Damascus, in *Artemisietum Herbae albae*, 850 m.; Jebel Tanf, 270 km E of Damascus, 810 m.; env. of Wadi Hauran, 315 km E of Damascus, 740 m.; 393 km E of Damascus; Wadi Muhammadi; 83 km SW of Hussetché (all 1933 EZ HJ); Jebel Tanf (1931 Gombault).

It differs from *B. densiflora* in colour of perigonium and anthers, in not appressed and thicker pedicels etc. From *B. nivalis* in broader more-flowered raceme, much bigger capsule etc. From *B. sessiliflora* and *B. desertorum* by its true capsule, and from the latter also by perigonal lobes which are only half as long as tube, etc.

The species seems to be chiefly confined to the association of *Artemisietum Herbae albae*.

¹ Dedicated to the memory of the young botanist GERSHON MOSHEOV who fell in 1936 while defending a Jewish settlement.

40. *B. decolorans* Bornm.

In Beih. Bot. Ctrbl. Abt. II 24 : 109 (1908).

12-15 cm. Bulb medium-sized. Leaves 3-6, lorate, often complicate, obtuse, with glabrous margin, flaccid, much longer than scape, about 10-12 cm. long, 6 mm. broad. Scape single. Flowering raceme ovate-cylindrical, few- (8-16)-flowered, 2-3 cm. long and about 1.5 cm. broad. Pedicels patulous, 2-3 mm. long, not elongating in fruit. Perigonium tubular-campanulate, 7-8 mm. long, pale sky-blue (dusky white or greenish-yellow when dried), lobes obovate, about one third as long as tube. Anthers blackish-violet, filaments triangular. Capsule short-pedicelled, valves suborbicular, 7-8 broad, non-retuse. — May.

Described from Persia. — In mountains. — Geogr. area : Persia. — Irano-Turanian (Iranian) species.

Specimens seen : PERSIA : In monte Kuh Sefid, dit. Kerfenschah (1903 *Strauss*, cotype ! HV).

Contrary to the data of BORNMUELLER the filaments of *B. decolorans* are fixed not at the middle of tube but at the base of lobes. The species thus does not belong to *Hyacinthella* ("sectionis *Hyacinthellae*"). Other characteristics of the plant also are typical for *Bellevalia*, as for instance, the number of leaves (3-6, not 2-3 as in *Hyacinthella*), their shape, etc.

B. decolorans is distinguished by its short flowering and fruiting pedicels, the pale-blue colour of perigonium, the glabrous leaf margin. It can be distinguished from other short-pedicelled species as follows : from *B. desertorum* by the size and shape of perigonium and by its true, not deciduous capsule ; from both *B. desertorum* and *B. Mosheovii* by narrower leaves and glabrous leaf margin ; from *B. nivalis* by glabrous leaf-margin, by size of capsule, etc. ; from *B. densiflora* by colour of perigonium and anthers, by size of perigonium, by looser raceme, etc.

41. *B. kurdistanica* Feinbr. sp. nov.

ICON. Tab. nostra XIX, 16.

25-35 cm. Bulbus profundus, 3 cm. diametro. Folia 5-6, lorata, scapum cingentia, 12-30 cm. longa, scapo longiora, margine breviter ciliata, folia exteriora 17-20 mm. lata. Scapi 2. Racemus floriferus ovatus usque ad oblongum, densum, ca. 25-florus, scapo multo brevior 3.5-5 cm. longus, 2-2.5 cm. latus ; pedicelli floriferi 5-7 cm. longi, patuli, lilacini. Flores superiores, saepe steriles, lilacini. Perigonium tubuloso-campanulatum, 8-10 mm. longum, ante anthesin album vel lilacinum, sub anthesi pallide luridum ; lobi ovati vel oblongi, tubo circiter duplo breviores. Antherae lilacinae. Pedicelli fructiferi 2 cm. longi, patuli. Capsula ovata — Apr.-Maio.

Geogr. area : Iraquian Kurdistan. — In deep moist soil. — Irano-Turanian (Iranian) species.

Specimens seen: IRAQ: Amadia, in fields in the valley, and in deep soil pockets on the hillside, 3500' (1931 Guest HJ type!); Kirkuk (1931 Guest HJ).

The dense raceme of this species is reminiscent of that of *B. densiflora*. However, it differs from this plant in colour of flowers, form and breadth of leaves, etc. This is the easternmost species of sect. *Patens*.

SUBSECT. *CAVAREA* (Mattei pro genere) Feinbr.

42. *B. sessiliflora* (Viv.) Kth.

Kunth Enum. 4: 309 (1843); Boiss. Fl. Or. 5: 305 (1884); Post Fl. sec. ed. 2: 652 (1933); Dur. et Bar. Fl. Lib. Prodr. 236 (1910).

ICON. Viv. Fl. Lib. (1824) t. 8 fig. 2.

SYN. *Hyacinthus sessiliflorus* Viv. Fl. Lib. Sp. 21 (1824); Baker Lin. Proc. 11: 429 (1871) Exsic. p.p.; Muschl. Man. Fl. Eg. 224 (1912). — *Cavarea sessiliflora* (Viv.) Mattei, in Bull. Ort. Bot. Nap. 5: 275-7 (1918).

10-30 cm. Bulb 2-3 cm. in diameter. Leaves 2-3, lanceolate, canaliculate, undulate, enveloping the scape, prominently nerved, ascending, then recurved, much longer than the 3-10 cm. long scape; margin scabrous or smooth; outer leaf 8-25 mm. Flowering raceme dense, spike-like, 8-20-flowered, 2.5-5 cm. long, 1-1.5 cm. broad, flowers sessile or on 1 mm. long, horizontal pedicels. Perigonium campanulate, 5-6 mm. long, light sky-blue, then lurid; lobes oblong, half opened, about half as long as tube. Anthers blue. Fruiting raceme cylindrical, prostrate. Pod sessile, valves somewhat papyraceous, forming more or less helicoidally curved wings, almost round, 11-13 mm. in diameter. Ovules 2 in each cell. — Dec.-Febr. — $2n=8$.

Sands or hills of the coast or cultivated soil. — Geogr. area: Sinai?, Lower Egypt, Cyrenaica, Tripoli. — Saharo-Sindian species.

Specimens seen: SINAI: Wadi el Grady (1880 Barbey No. 863 HB)? LOWER EGYPT: Ile aux Rougets, Mandara (1879 Letourneux HPa HR); Mandara, prope Alexandriam, in palmetis et inter segetes (1877 Letourneux No. 140 HP HV; 1878 HR HV); prope Alexandriam (1856 Samaritani No. 3247 HV HPa); Ramle (1876 Letourneux HPa); Mariut, in sandy soil (1914 Bolland HJ); Mariut, inter segetes (1878 Letourneux HPa). CYRENAICA: Bengasi (1882, 1883 Ruhmer HJ HB); Derna, frequens in collibus aridis saxosis calcareis, alt. 10-200 m. (1913 Vaccari HR). TRIPOLI (1882 Krause).

The varieties described by FREYN (1885) based on different breadth of leaves, seem, as already remarked by PAMPANINI (1914), to be inconstant.

The area of the species extends along the N. African coast from Tripoli to Egypt. (The specimens of Sinai could not be exactly determined). It is a Saharo-Sindian plant, occurring in the most favourable places, and apparently avoiding salty soil.

B. sessiliflora, as well as *B. desertorum*, is very curious with regard to the mode of dispersion of fruits. Both species possess an indehiscent fruit shedding

as a whole, contrary to all other species of the genus which possess a true capsule opening at tip. On the basis of the above characteristics of fruit and the reduced pedicels, MATTEI (1918) proposed to establish for this species a separate genus, *Cavarea*. We do not think that these characteristics are sufficient to form a separate genus. But we have established a subsection *Cavarea*, comprising besides this species also *B. desertorum* which possesses the same type of synaptospermic fruit.

43. *B. desertorum* Eig et Feinbr.

in Beih. Bot. Ctrbl., 49 Abt. II: 666 (1932).

8-15 cm. Bulb small or medium. Leaves 2-7 (usually 4-5), lanceolate or lorate, prostrate, sometimes canaliculate, somewhat fleshy, longer than scape, 7-15 m. long, margin short-ciliate or scabrous; outer leaf 8-15 mm. Scares 1-3. Flowering raceme dense, usually sessile, ovate to oblong, 10-25-flowered, 2-4 cm. long, 1.5-2 cm. broad. Bracts more or less conspicuous. Flowering pedicels very short (1-3 mm.). Flowers almost erect; perigonium 8-13 mm. long, light-lilac or light-blue, tube ovate or tubular, lobes more or less divergent, oblong, about as long as tube. Anthers purple or violet. Fruiting raceme spike-like, with very short pedicels. Fruit indehiscent, falling in one piece, winged, valves almost round, 7-12 mm. in diameter. Seed globular or ellipsoid, large. — Jan.-March. — $2n=8$.

Described from Palestine (Negeb). Type in Jerusalem. — Steppes. — Geogr. area: Palestine: Judean Desert, Jordan Valley, Negeb. — A plant of connection of the Irano-Turanian (Mesopotamian) and Saharo-Sindian elements.

Some of the specimens seen (some in living state): PALESTINE: Judean Desert: De Jérusalem à Jéricho (1880 Barbey HB); 8 km E of Jerusalem, 580 m. (1934 EFZ HJ); Khan Hatrur, km. 19 E of Jerusalem (1935 EZ Grizi HJ); Wadi Kelt (1935 EZ Grizi HJ); betw. Tekoa and Ein Gedi (1926 Z HJ); env. of Ras Zuweira (1926 Z HJ). Jordan Valley: Jericho (1911 Dinsmore et Meyers HJ); betw. Jericho and Jordan (1925 E HJ). Negeb: Tel Arad (1922 E HJ); env. of Kurnub (1936 EFZ HJ).

Contrary to the previous opinion of the authors on this species, it is not allied with *Hyacinthella nervosa*, from which it differs in some fundamental features: (1) The anthers are attached at the mouth of tube and not in its middle; it is true, however, that because of the length of lobes the anthers are hidden within the flower. (2) The fruit is three-winged and not rounded at angles, as in *Hyacinthella*. (3) The seed is smooth. — The species was collected (in fruit) by BOISSIER and BARBEY, but was confused with *B. sessiliflora*, from which it can be easily distinguished by the characters of leaves, size of perigonium, by the usually smaller fruit etc.

This is a steppical endemic species, occurring in different steppe associations, as *Noaetum mucronatae*, *Artemisietum Herbae albae*, etc.

SECT. *MUSCARIOIDES*44. *B. atrovioacea* Rgl.

Regel in Ac. Hort. Petr. 8, 2: 655 (1884); Fl. URSS 4: 397 (1935).

ICON. Regel l.c. tab. VI.

SYN. *Hyacinthus atrovioaceus* B. Fedtsch. Rast. Turkest. 250 (1915).

15-20 cm. Bulb medium sized (2.5-3 cm.). Leaves 4-6, lorate, as long as scape, 10-20 cm. long, margin with short, more or less rigid ciliae; outer leaf 4-10 mm. broad. Scape 1, erect. Flowering raceme ovate or oblong, shorter than free portion of scape, 2.5-3 cm. long; pedicels slender, very short (2-3 mm.) nodding during flowering, usually violet. Perigonium tubular-campanulate, dark-violet, not changing in herbarium, 8-9 mm. long; lobes expanded, ovate, about half as long as tube. Anthers blue. Capsule? — March.

Described from Turkestan. Type in Leningrad. — Slopes of mountains. — Geogr. area: Russian Middle Asia (Pamiro-Alai). — Irano-Turanian (Turanian) species.

Specimens seen: RUSSIAN MIDDLE ASIA: Murgab, 4500' (1883 Regel HB HF HV); inter Dengere et Sangtoda (1884 Regel HBr); Baldschuan (1883 Regel HB); pr. pagum Mirschade ab urbe Bajssun (1928 Vvedensky HBr HD HJ HR HV).

This species, growing in the north-eastern border of the geographical area of the genus, is characterised by the deep-violet colour of its flowers, which does not change even in dried specimens. We have not seen any fruiting specimens.

45. *B. turkestanica* Franch.

Franch. in Ann. Sc. Nat. Ser. 6, 18: 256 (1884); Fl. URSS 4: 396 (1935).

SYN. *Hyacinthus turkestanicus* Fedtsch. in sched.

Leaves 4, lorate, canaliculate, acute, longer than scape, with prominent nerves and short-ciliate or scabrous margin; outer leaf 5-7 mm. broad. Scape 10 cm. long. Flowering raceme oblong or obovate, dense, with white bracts. Flowering pedicels as long as or shorter than flowers, nodding. Perigonium campanulate, 6 mm. long, blue, in herbarium dirty-brown; lobes as long as tube, lanceolate to triangular. Anthers violet. Fruiting pedicels curved. Capsule rounded. — March.

Described from Ibrahimata. Type in Paris. — Slopes. — Geogr. area: Russian Middle Asia (Pamiro-Alai). — Irano-Turanian (Turanian) species.

We had no specimens for examination, but according to several characteristics it seems to be related to *B. atrovioacea* (e.g. shape of raceme, length and position of flowering pedicels, colour of flowers which, however, fades on drying).



1. *Bellevalia macrobotrys* Boiss. 2. *B. Warburgii* sp. n. 3. *B. Eigii* sp. n.
4. *B. Tauri* sp. n. 5. *B. alexandrina* sp. n.

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6. *Bellevalia stepporum* sp. n. var. n. *edumea*. 7. *B. stepporum* sp. n. var. n. *transjordanica*. 8. *B. palmyrensis* sp. n. 9. *B. latifolia* sp. n. 10. *B. Zoharyi* sp. n. 11. *B. flexuosa* Boiss. 12. *B. Mosheorii* sp. n.

SPECIES NOT SUFFICIENTLY KNOWN

B. oxycarpa Haussk. et Bornm.

This plant is reported by BORNMUELLER in *Plantae Straussianae* (p. 108) as follows: "Im Herbar HAUSSKNECHTS befinden sich noch zwei Individuen einer *Bellevalia*, die ebenfalls bei Sultanabad (April 1890) von STRAUSS gesammelt wurden und von HAUSSKNECHT als *B. oxycarpa* Hausskn. sp. nov. bezeichnet wurden. Es sind verblühte resp. fruchtende Exemplare, doch stehe ich davon ab, dieselben zu beschreiben, da es den Anschein erweckt, dass sie obiger *B. dichroa* angehören. Die Blüten sind ebenfalls fast bis zur Basis geteilt, nur die Fruchstiele sind stark verlängert, 3 cm lang. Die Klappen der Kapsel sind breit-eiförmig, an der Basis abgestutzt, oben spitzlich, etwa 8 mm breit. Die Tracht und auch die rote Färbung der Achse und der Blütenstiele ist die gleiche wie bei *B. dichroa*. Dass die Pflanze unter keinen Umständen zu der im Gebiet verbreiteten *B. ciliata* β *glauca* gehört, beweisen die tiefgeteilten Perigone und die spitzen (nicht abgestumpften ausgerandeten) Kapselklappen. — Auch neuerdings (12.V.1904) traf Konsul STRAUSS die gleiche Pflanze aber mit noch längeren Fruchstielen wiederum an, und zwar auf dem s.-ö. von Kermanschah gelegenen Kuh-Sefid. Fruchtexemplare unzweifelhaft echter *B. dichroa* sind abzuwarten, bevor *B. oxycarpa* mit Sicherheit mit genannter Art vereinigt werden kann."

It is rather difficult to obtain any idea of this plant without examination of the type specimen.

B. tessalonica Bornm.

Fedde Repert. 30 : 356-7 (1932).

The description of this species is quite insufficient. This is the text concerning this species: "Aus der Umgebung von Saloniki (von der Gueltepé beim Dorfe Kereci-köj; gesammelt 5.IX.1909 von Dimonie) liegt mir noch ein *Hyacinthus* der Sektion *Eu-bellevalia* vor, der (bestimmt als "*Bellevalia leucophaea* Boiss.") mit *B. dubia* (Guss.) R. et Sch. und *B. trifoliata* (Ten.) Kunth verwandt ist und wohl eine neue Art (*B. thessalonica* m.) darstellt (a *B. dubia* eximie diversa perigonii tubo angusto dentibusque limbi brevissimis tubo 4-plo brevioribus; a *B. trifoliato* specifice discedens corollis minoribus foliisque margine non ciliatis)."

Phytogeographical

The geographical area of the genus *Bellevalia* stretches from the 10° W. to 78° E. longitude and from 30° to 51° N. latitude. It comprises contiguous parts of three continents—Asia, Africa and Europe. As regards the number of *Bellevalia* species in each continent, Asia is the richest. (Table II). Moreover, it is in Asia, and especially in Persia and Asia Minor, that the discovery of new species may chiefly be expected. In Transcaucasia and Palestine, and to a less degree in Syria, the genus *Bellevalia* has been studied more or less thoroughly.

Table II. The numerical distribution of the 45 *Bellevalia* species

Continent	Number of species	%
Asia	35	77,7%
Africa	8	17,7%
Europe	7	15,5%

Table III shows the numerical distribution of *Bellevalia* species in different countries.

The geographical relations of the genus are emphasized more clearly, if we consider the distribution of its species in the individual phytogeographical regions comprised within the generic area. As is seen from the maps of areals (Plate XX), the regions in question are the Irano-Turanian, Mediterranean, and some less arid parts of the Saharo-Sindian (EIG 1931).

The relative importance of the geographical groups of *Bellevalia* species becomes still more prominent if they are arranged according to their distribution in the phytogeographical subregions as follows:

- (1) Mediterranean: 16 species.
 Omni-Mediterranean: 2 (*trifoliata*, *ciliata*).
 West-Mediterranean: 5 (*dubia*, *Webbiana*, *romana*, *variabilis*, *fallax*).
 East-Mediterranean: 7 (*Lipskyi*, *Clusiana*, *Tauri*, *Warburgii*, *trojana*, *nivalis*, *flexuosa*).
 South-Mediterranean: 2 (*mauritanica*, *alexandrina*).
- (2) Irano-Turanian: 27 species.
 Omni-Irano-Turanian: 1 (*macrobotrys*).
 Sarmatic: 1 (*sarmatica*).
 Iranian: 15 (*dichroa*, *Aucheri*, *lutea*, *Fomini*, *araxina*, *longistyla*, *gracilis*, *albana*, *glauca*, *Wilhelmsii*, *montana*, *Saviczii*, *speciosa*, *decolorans*, *kurdistanica*).
 Turanian: 2 (*atroviolacea*, *turkestanica*).
 Mesopotamian: 8 (*Eigii*, *longipes*, *latifolia*, *stepporum*, *palmyrensis*, *Zoharyi*, *densiflora*, *Mosheovii*).
- (3) Saharo-Sindian: 1 (*sessiliflora*).
- (4) Irano-Turanian (Mesopotamian) — Saharo-Sindian: 1 (*desertorum*).

Evidently, the Irano-Turanian region is numerically the most important in the geographical distribution of *Bellevalia* species. Among its subregions, the Iranian and Mesopotamian are first in importance. Next comes the ecologically allied East-Mediterranean subregion with its 7 species.

The geographical peculiarities of the individual sections are emphasized in Table IV.

Table IV. The distribution of sections in the phytogeographical regions

	Sect. <i>Nutans</i>	Sect. <i>Conica</i>	Sect. <i>Patens</i>	Sect. <i>Muscarioides</i>
Mediterranean	9	2	5	—
Irano-Turanian	6	15	4	2
Saharo-Sindian	—	—	1	—
Ir.-Tur.-Sah.-Sin.	—	—	1	—
Total	15	17	11	2

Thus in sections *Nutans* and *Patens*, Mediterranean species prevail, while in sect. *Conica* the Irano-Turanian prevail.

The area of sect. *Conica* (Plate XX B) is the largest, and almost coincides with the area of the whole genus; but its range of greatest species concentration is found between Transcaucasia and Palestine-Syria. The area limits of sect. *Nutans* (Plate XX A) are much more restricted, and nowhere reach those of the genus; they are especially remote from them in the east and north-east. Generally, the species are rather homogeneously scattered over the area. The area of sect. *Patens* (Plate XX C) is still smaller and is expanded chiefly in the western part of the generic area; a species concentration is found at about the East-Mediterranean region. The sect. *Muscarioides* (Plate XX A) is smallest in area, as in number of species, and nests in the north-eastern corner of the generic area.

Definite phytogeographical differentiation may be also made after the subsections. Thus, the species of subsect. *Orientalis* concentrate in the Iranian subregion, and those of subsect. *Occidentalis* in the Mesopotamian subregion. Subsect. *Albiflora* is found as a whole in the East-Mediterranean and in the contiguous Mesopotamian subregions.

We distinguish three types of *Bellevaia* areas, according to their size: large, medium and small areas.

The large-sized type is rather rare. Referring to areas of this type there are but 5 species: *trifoliata*, *dubia*, *ciliata*, *sarmatica* and *romana*. All these areas are situated in the western and northern parts of the generic area; three of them even in the western part of the Mediterranean region. Four among these are more or less prominently disjunct. The area of *B. dubia* shows a wide disjunction between its main body and a remote fragment in Southern Portugal. However, even the main part of the area is not continuous, but is rather dissected by seas and straits, and includes several islands (Sicily, Ionic Islands, etc.). The areas of *B. trifoliata*, *B. ciliata* and *B. romana* are similar. The

IN THE DIFFERENT COUNTRIES OF ITS OCCURRENCE

Conica	Sect. Patens	Sect. Musca-rioides	Number of species in each country	
<i>B. turkestanica</i> Franch.			+	3
<i>B. atrovirens</i> Reg.			+	9(10?)
<i>B. desertorum</i> Eig & Feinbr.			+	1
<i>B. sessiliflora</i> (Viv.) Kunth.			+	6
<i>B. kurdistanica</i> Feinbr.			+	5
<i>B. decolorans</i> Bornm.			+	8(9?)
<i>B. Moschevii</i> Feinbr.			+	2
<i>B. flexuosa</i> Boiss.			+	9(10?)
<i>B. nivalis</i> Boiss.			+	10
<i>B. densiflora</i> Boiss.			+	1?
<i>B. fallax</i> Pom.			+	3
<i>B. variabilis</i> Freyn.			+	1(2?)
<i>B. romana</i> (L.) Rehb.			+	1
<i>B. Zoharyi</i> Feinbr.			+	5
<i>B. palmmyrensis</i> Feinbr.			+	2
<i>B. stepporum</i> Feinbr.			+	1
<i>B. latifolia</i> Feinbr.			+	2
<i>B. speciosa</i> Wor.			+	1
<i>B. Saviczii</i> Wor.			+	5
<i>B. montana</i> Boiss.			+	1
<i>B. Wilhelmii</i> (Sev.) Wor.			+	1
<i>B. glauca</i> (Lindl.) Kunth.			+	2
<i>B. albana</i> Wor.			+	4
<i>B. gracilis</i> Feinbr.			+	1?
<i>B. samatica</i> (Pall.) Wor.			+	2
			+	1
			+	2

area of *B. ciliata* extends over S. Europe and N. Africa; *B. trifoliata* extends over a bigger area than that of any other *Bellevallia* species; however, the plant occurs in scattered and often remote stations (p. 344). The only more or less continuous area is that of *B. sarmatica*, which is the northernmost species of the genus. Among the five named above it seems to be the only species occurring in dry habitats such as steppes and dry slopes; the other four grow in more humid places, such as more or less humid fields, cultivated soil and meadows.

Eleven *Bellevallia* species have medium-sized areas (*macrobotrys*, *mauritanica*, *longipes*, *albana*, *glauca*, *Saviczii*, *stepporum*, *fallax*, *Mosheovii*, *sessiliflora*, *atroviolacea*). Not all these areas show the real geographical relations of the species. In some species the area boundaries join extreme and rather remote points, between which no stations have been found so far. Such is the case of *B. atroviolacea*, *B. fallax*, *B. glauca*, *B. albana*. Moreover, in several cases we connected stations of the typical form with rather remote stations of a variety whose real nature is not yet sufficiently known (case of *B. fallax*), or with those of a non-typical form, whose relations to the species still require a more thorough study (case of *B. glauca*). Some of these species are as yet insufficiently known and their area limits are only provisional (*B. Saviczii*, *B. mauritanica*).

The areas of *B. longipes*, *B. stepporum* and *B. Mosheovii* are on the contrary relatively well-based. The species, although morphologically heterogeneous (in *B. stepporum* we distinguished three varieties), undoubtedly possess naturally delimited areas. The almost exact convergence of these three areas in Transjordan and the Syrian Desert, whose ecological conditions are rather homogeneous, is remarkable.

It is obvious that several areas of this group will be enlarged, while others will have to be restricted.

The bulk of species belonging to the genus, 28 in number, have small geographical areas. Several of these were found only once and are still insufficiently known. Their areas may enlarge to a certain degree when they become more completely studied. Many of them were recorded from Persia, such as *B. Aucheri*, *B. dichroa* and *B. decolorans*. The majority of species, however, are really restricted in their geographical distribution. Among them, few areas can be regarded as relics, such as that of *B. Lipskyi*, but the majority seem to be young, and to correspond well with the special ecological conditions of their habitats (as already mentioned by WORONOW, 1927, for the Transcaucasian species, whose areas he designates as "nestlike").

For the understanding of the phylogeny of *Bellevaia* species it is important to emphasize the occurrence of vicarious species and forms. In several cases morphological differences between vicarious forms are distinct enough as to enable us to regard them as separate species. Such is *B. variabilis*, which is a North African vicarious form of the European *B. romana*. Others we regard as sub-species, as in the case of *B. dubia* (the Balcanic ssp. *Boissieri* and the S. Portugese ssp. *Hackeli*; the latter has to be studied more carefully on living material) and of *B. macrobotrys* (ssp. *Pomelii*).

The ecological conditions peculiar to *Bellevaia* species shall be examined briefly here. We are able to record more or less precise ecological data only for the Palestinian species. For numerous other species information on their typical habitats is not final. It can, however, be said that, generally, most *Bellevaia* species are adapted to xerophytic conditions. Many grow in steppical associations. Except for *B. Saviczii*, which is recorded by WORONOW "in *Juniperetis*" no single species is known from forest or maquis associations. Only 6 species occur on mountains above 1000 metres above sea-level. Generally, *Bellevaia* species are confined to lower mountains. The genus is thus neither a forest nor a high-mountain genus. Several species (6) are recorded only from fields and cultivated soil.

In Palestine we distinguish 3 ecological groups of *Bellevaia*:

(1) Plants of the Mediterranean Batha — *B. flexuosa*. This species occurs in Palestine chiefly in the *Poterietum spinosi*, on "terra rossa".

(2) Plants of fields and cultivated places, on heavy soil generally inundated in winter. These are: *B. trifoliata*, *B. macrobotrys* (in Transcaucasia occurring in steppes and dry slopes), *B. Warburgii*, *B. longipes*. We found that these species are mostly connected to the *Prosopis Stephaniana* — *Cynara syriaca* association.

(3) Steppe plants — *B. stepporum*, *B. Zoharyi*, *B. Mosheovii* and *B. desertorum*. We recorded them from *Artemisietum Herbae albae* and from different associations of *Chenopodiaceae*, etc.

Some Considerations on the Phylogeny of the Genus Bellevaia

As shown in maps of areas (Plate XX), the whole geographical area of the genus *Bellevaia* is situated within a region called by POPOV (1928-29) the Old-Mediterranean region and covers the larger part of it. This type of geographical area which extends from the Atlantic

EXPLANATION OF MAPS — PLATE XX.

A:

Sect. *Nutans* Feinbr.Subsect. *Colorata* Feinbr.

- _____ *B. trifoliata* (Ten.) Kth.
 *B. macrobotrys* Boiss.
 ■■■■■■■■ *B. dubia* (Guss.) Kth.
 ++++++++ *B. Webbiana* Parl.
 - - - - - *B. Lipskyi* (Miscz.) Wulff.
 * * * * * *B. Clusiana* Griseb.
 ~~~~~ *B. Tauri* Feinbr.  
 . . . . . *B. dichroa* Haussk.  
 ~~~~~ *B. Aucheri* (Bak.) Feinbr.  
 ~~~~~ *B. lutea* Bordz.  
 + + + + + *B. Fomini* Wor.  
 ~~~~~ *B. mauritanica* Pomel.

Subsect. *Albiflora* Feinbr.

- _____ *B. Warburgii* Feinbr.
 m m m m m *B. alexandrina* Feinbr.
 ~~~~~ *B. Eigii* Feinbr.

Sect. *Muscarioides* Feinbr.

- \_\_\_\_\_ *B. atrovioacea* Reg.  
 ~~~~~ *B. turkestanica* Franch.

B:

Sect. *Conica* Feinbr.Subsect. *Orientalis* Feinbr.

- *B. ciliata* (Cyr.) Ness.
 *B. longipes* Post
 ~~~~~ *B. trojana* Feinbr.  
 \_\_\_\_\_ { *B. araxina* Wor.  
                   *B. longistyla* (Miscz.) Grossh.  
 \_\_\_\_\_ *B. sarmatica* (Pall.) Wor.  
 ~~~~~ *B. gracilis* Feinbr.  
 ~~~~~ *B. albana* Wor.  
 \_\_\_\_\_ *B. glauca* (Lindl.) Kth.  
 ~~~~~ *B. Wilhelmsii* (Stev.) Wor.  
 ~~~~~ *B. montana* (C. Koch) Boiss.

Subsect. *Occidentalis* Feinbr.

- ++++++ *B. Saviczii* Wor.  
 ++++++ *B. speciosa* Wor.  
 ~~~~~ *B. latifolia* Feinbr.  
 ~~~~~ *B. stepporum* Feinbr.  
 ~~~~~ *B. palmyrensis* Feinbr.  
 m m m m m *B. Zoharyi* Feinbr.

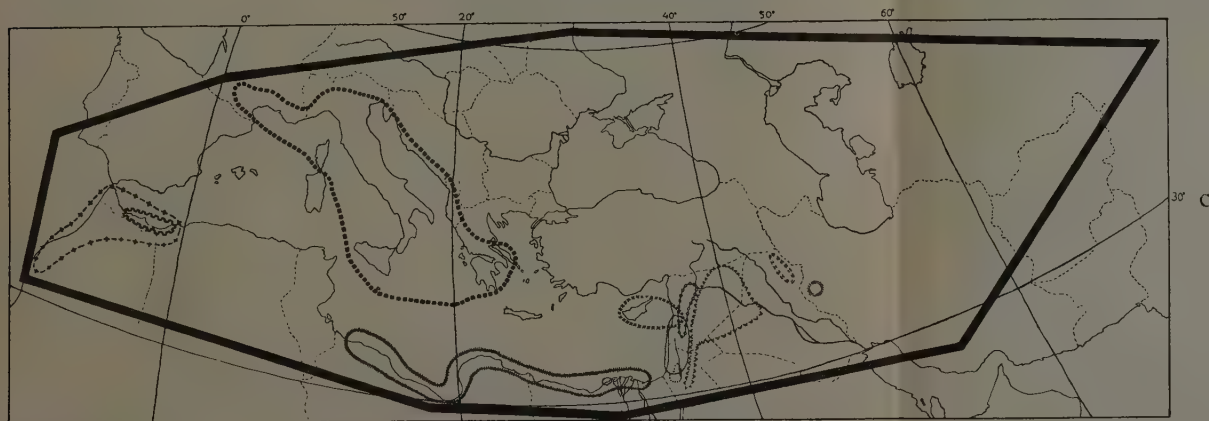
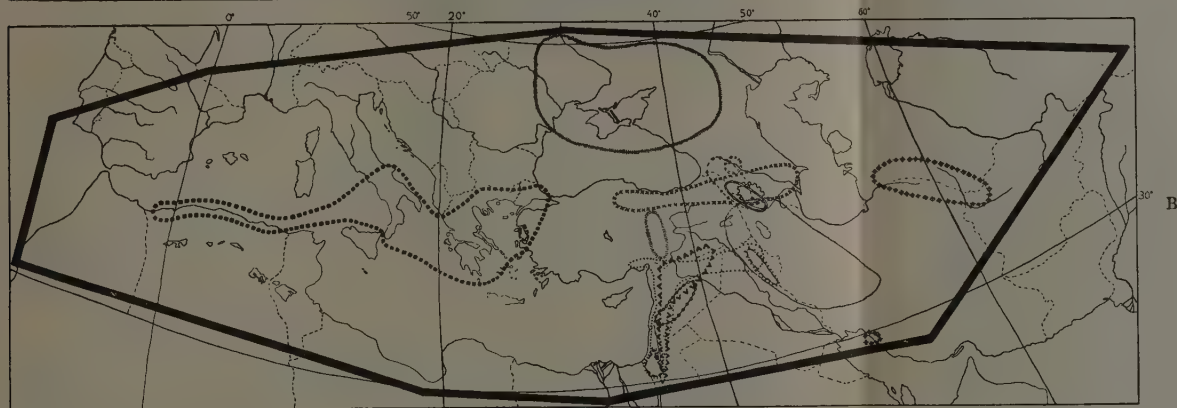
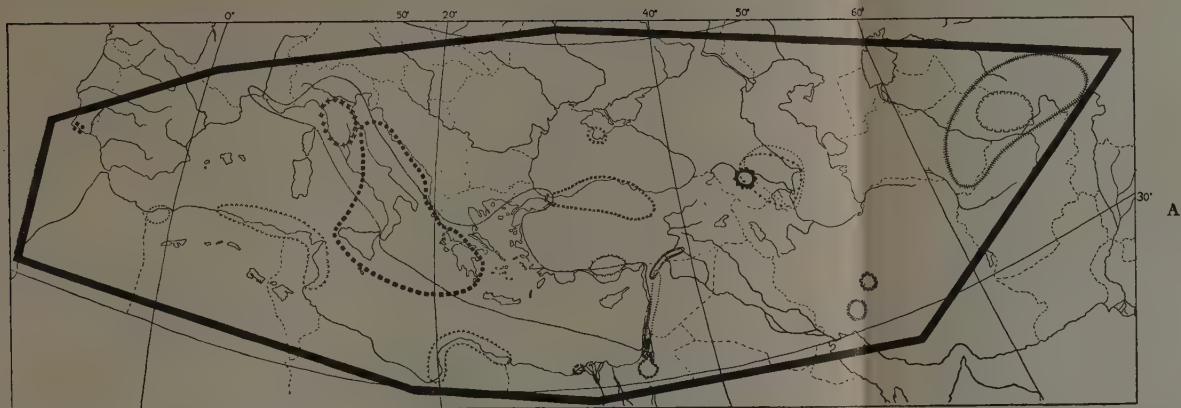
C:

Sect. *Patens* Feinbr.Subsect. *Romana* Feinbr.

- *B. romana* (L.) Rchb.
 *B. variabilis* Freyn
 ~~~~~ *B. fallax* Pom.  
 ~~~~~ *B. densiflora* Boiss.  
 ~~~~~ *B. nivalis* Boiss. et Ky.  
 \_\_\_\_\_ *B. flexuosa* Boiss.  
 ~~~~~ *B. Mosheovii* Feinbr.  
 ~~~~~ *B. decolorans* Bornm.  
 ~~~~~ *B. kurdistanica* Feinbr.

Subsect. *Cavarea* (Mattei) Feinbr.

- _____ *B. sessiliflora* (Viv.) Kth.
 *B. desertorum* Eig et Feinbr.



coast in the West to Middle Asia in the East is rather typical to a large group of genera, such as *Aegilops* (EIG 1929, 1936), *Cicer* (POPOV l.c.), *Trigonella* (SIRJAEV 1935), and many others.

The area designated by POPOV as the Old Mediterranean region corresponds to the three phytogeographical regions described by EIG (1931) as the Mediterranean, the Irano-Turanian and the Saharo-Sindian. We agree with Popov in that "the Old Mediterranean region can be certainly held as a distinct phytogeographical kingdom, equal in its rank to Paleotropis, Neotropis, Capensis or Australis" (p. 55). This is not the place to state the reasons for accepting this opinion; it can only be mentioned that besides the common origin of their floras, the three afore-named regions have the same basic climate type in common, namely, a warm and rainless summer alternating with a cool and wet winter. This similar climatic character, although exhibiting quantitative differences of temperature and humidity, finds its best expression in the essentially similar course of their hydrothermic curves (EIG 1931).

In order to avoid confusion between the Old Mediterranean kingdom and the Mediterranean region which forms only a part of it, we propose to call the former the Mesogean¹ kingdom. However, we wish to emphasize the importance of differentiation of this kingdom into three phytogeographical regions, namely Mediterranean, Irano-Turanian and Saharo-Sindian, each of which represents a vegetational and ecological unit.

The inconvenience of the term "Old Mediterranean region" has been already discussed by EIG (1938). In his paper he objected to using the same term for notions of both historical and recent (floristico-ecological) phytogeography. EIG proposed, therefore, to use the term Tethys region, vegetation etc. for purposes of historical phytogeography, and to leave the term Mediterranean only for the recent Mediterranean region (which is much more restricted in area). So he would call Tethys vegetation the Tertiary vegetation of the area covered by sea at the beginning of the Tertiary. Our term Mesogean vegetation has, on the contrary, to be applied to recent vegetation of the mentioned area.

The origin of the genus *Bellevalia* is connected with the origin of the Mesogean flora, a problem to which a rather rich literature is de-

¹ Mesogée—term proposed by H. DOUVILLE for the Tethys sea.

voted (e.g. ENGLER 1879; POPOV 1928-29; GAMS 1933; BRAUN-BLANQUET 1937). This problem, however, is far from being solved.

According to POPOV (l.c. p.55) there is no doubt that from the early Tertiary the flora of the "Old Mediterranean" developed under the influence of contact of the northern and southern floras: the mesophilous forest flora on the one hand, most strongly developed in Eastern Asia (principally in China) and in North America, and the African flora on the other, principally xerophilous and desert.

It is known that during the early Tertiary (Paleogen) almost the whole area of the Mesogeian kingdom was covered by sea. But from the end of the Paleogen period and during the late Tertiary (Neogen), the Tethys sea receded, attaining its minimum size in the Pliocene. The climate, which in the Miocene was more or less homogeneous throughout the region, in the Pliocene probably became more maritime in the West and more continental in the East.

During the Miocene, North Africa emerged from the sea. At that period contact was established between the northern and the Old African flora. This contact was achieved principally in North-West Africa which was then connected with southern Spain, and it was then that the development of the "contact flora of the Old Mediterranean" began. During the Pliocene, with the progressive development of the continental parts of the area, this flora developed considerably.

The rôle of the African element in the formation of this flora, emphasized by ENGLER as early as 1879, is generally accepted (POPOV 1928-29; GAMS 1933; BRAUN-BLANQUET 1937). According to BRAUN-BLANQUET the following elements participated in the composition of the Pliocene flora of the Mediterranean: the North-American, the Sino-Japanese, the South-African, the Centro-Asiatic and the tropical. Besides the various elements that invaded these newly formed parts of continents, many new forms developed during the Pliocene *in situ*, the result of adaptation to the new ecological conditions of the area.

In his analysis of the origin of the genus *Cicer*, one of the Mesogeian genera, POPOV makes the following conclusions: the genus *Cicer* originated during the Miocene as a result of hybridization between a northern type, *Vicia*, and a "contact genus", *Ononis*, itself formed by hybridization of the northern *Trifoliae* with the African *Genisteae*.

The formation of the genus *Trigonella* and also of various other genera of the same area type dates, according to SIRJAEV (1935), from the end of the Miocene, and is connected with the regression of sea in the Mediterranean and Central-Asiatic basins at that period.

Is it possible to trace some points on the mode, time and place of origin of the genus *Bellevalia*? We shall try to point out some considerations on this problem.

According to ENGLER and PRANTL (1889) the genus *Bellevalia* (as section of *Hyacinthus*) belongs to the group of *Lilioideae-Scilleae*, containing 23 genera. According to a more recent opinion on these genera their number is to be increased. Geographically the genera may be divided into the following groups:

(1) 14 African genera (principally S. African and partly tropical — *Albuca*, *Galtonia*, *Drimia*, *Rhadamanthus*, *Lithanthus*, etc.).

(2) 8 genera of the Mesogean kingdom (*Chionodoxa*, *Puschkinia*, *Hyacinthus*, *Hyacinthella*, *Strangweia*, *Bellevalia*, *Muscari*, *Leopoldia*).

(3) 1 North-American genus (*Camassia*).

(4) 4 genera distributed in both Africa and the Mesogean kingdom, and partly also in Europe. (*Urginea*, *Dipcadi*, *Scilla*¹, *Ornithogalum*).

The last group of genera seems to be the most ancient. It is the result either of contact of the Old-African with the northern genera, or of further development of African genera in the invaded region. Some of them, as for instance *Scilla*, have a more or less distinct mesophilous character. As to the North-American genus, *Camassia*, its origin is obscure and has to be carefully studied. It is, however, worth noticing that it has its nearest taxonomic relations with the genus *Scilla* and has possibly originated from it before the N. American continent separated from Europe. Ecologically it is a mesophilous group chiefly confined to wet meadows. After the African types of *Scilleae* reached the Tethys region (in the sense of EIG), probably in the Miocene, a new centre of development was formed there, and new genera gradually originated. Meanwhile, a second centre seems to have developed in South-Africa (the group of African genera).

As evidence of the African origins of the Mediterranean *Scilleae* one may consider, for instance, the occurrence in the Mediterranean region of a few *Ornithogalum* species of the principally S. African sections *Beryllis* and *Caruelia*, as well as the formation of the section *Heliocharmos*, which is entirely confined to the Mesogean kingdom. The close relation of the Mesogean genera *Hyacinthella*, *Bellevalia*,

¹ According to CHOUARD (1931) *Scilla* has to be subdivided into *Scilla* s.s., *Endymion* and *Ledebouria*.

Muscari with the S. African genus *Periboea* (CHOUARD 1931¹, and ENGLER-PRANTL 1889, 1930²) has also to be emphasized.

Let us now see what are the origins of the more restricted group of genera called *Hyacintheae* by CHOUARD. According to BAKER (1871), and ENGLER and PRANTL (1889) this group contains the genera *Hyacinthus*, *Muscari*, *Chionodoxa* and *Puschkinia*. Within this group (with certain changes of limits) CHOUARD distinguishes the genera *Hyacinthus*, *Hyacinthella*, *Strangweia*, *Periboea*, *Bellevalia*, *Muscari*. In our opinion, the genus *Leopoldia*, mostly regarded as a section of *Muscari*, has also to be considered as a separate genus. Geographically, except for the S. African *Periboea*, these genera belong to the Mesogean kingdom and most probably developed within it.

We are not inclined to place the origin of the primary types of Mesogean *Hyacintheae* as far back as the Miocene, at least not of those of *Hyacinthella*, *Bellevalia*, *Leopoldia*, and *Muscari*. This period is supposed to be the time of origin of *Cicer*, *Trigonella* and *Ononis* (POPOV l.c., SIRJAEV 1932, 1935). It is more probable that most of our genera appeared in the Pliocene, perhaps even at its end, when the climate was similar to the recent climate. Phytogeographically, the genera *Cicer*, *Trigonella* and *Ononis* show different characters which would set them aside as older than the *Hyacintheae*. Their areas somewhat exceed the limits of the Mesogean kingdom, extending both to the south and north of it; besides, they comprise the Canary Islands and most Mediterranean islands, such as Corsica, Sardinia, etc. *Bellevalia*, on the contrary, is absent from the Canary Islands and Sardinia, and is poorly represented in most of the islands (see Table III, p. 388, 389).

We shall now try to trace some lines of development within the genus. The first question is what are the groups that can be regarded as more ancient. There are reasons to assume that sect. *Conica* is younger than sections *Nutans* and *Patens*. The conical shape of the raceme peculiar to sect. *Conica* is to be regarded as a secondary morphological character. All other sections of *Bellevalia* as well as the

¹ Unfortunately, we did not know of the paper by CHOUARD when dealing with the characters delimiting the genus. But we are satisfied that in vegetative characters also, *Bellevalia* can be distinctly separated from *Hyacinthus*. On the other hand, we insist that *Bellevalia*, *Hyacinthella*, *Muscari* and even *Leopoldia* each represents a separate genus.

² According to ENGLER and PRANTL, *Periboea* is a mere section of *Hyacinthus*.

allied genera, except for *Leopoldia*, possess a cylindrical raceme. In *Leopoldia*, too, the conical raceme is rather rare.

It is more difficult to express any opinion upon the relative age of sect. *Muscarioides*, which resembles the genus *Muscari* in several characters. It is either a young eastern branch of the genus showing a new direction of development, or a relic of an old branch now degenerating. The resemblance to *Muscari* raises the question of the part this genus played in the origin of this section. In this respect no positive evidence is known so far.

As to sect. *Nutans* and *Patens* it may be presumed that they originated at about one and the same time; this is shown by the similarity in shape of the larger areas of some more ancient species of both sections, as *B. trifoliata*, *B. dubia*, *B. romana*, and by their ecological similarity. The species of sect. *Nutans* show a morphological kinship to *Leopoldia*, those of sect. *Patens*, especially *B. romana*, to *Hyacinthella*. The primitive type of *Bellevallia* seems to have had relations with both of these genera. It is difficult to say whether hybridization with *Leopoldia* and *Hyacinthella* played any rôle in the origin of these sections. Anyway, there is no caryological evidence to warrant an assumption of this kind. The basic chromosome number of these genera is $x=9$, that of *Bellevallia* is $x=4$.

There is more evidence of the relative age of subsections. Subsect. *Albiflora* (sect. *Nutans*) seems to me younger than subsect. *Colorata* for the following morphologic, caryologic and geographical reasons: (1) Two among the three species of subsection *Albiflora*, *B. Warburgii* and *B. alexandrina*, are polyploids, while no polyploids were found so far in subsect. *Colorata*. (2) Disjunct and also large areas are peculiar to several species of subsect. *Colorata*, while all species of subsect. *Albiflora* have small areas. (3) The white colour of perigonium characteristic of subsect. *Albiflora* seems to be a secondary character in the sect. *Nutans*. For the same reasons subsect. *Occidentalis* of sect. *Conica* can be considered younger than subsect. *Orientalis*. In subsect. *Orientalis* are found large disjunct areas; no polyploids were found among them, while 2 species are known as polyploids in subsect. *Occidentalis*. Subsect. *Cavarea* (sect. *Patens*), characterized by the indehiscent pod, is certainly younger than subsect. *Romana* with its typical capsule.

The scheme in Fig. 36 represents the directions of development within the genus *Bellevallia* and its supposed relationship with the allied genera.

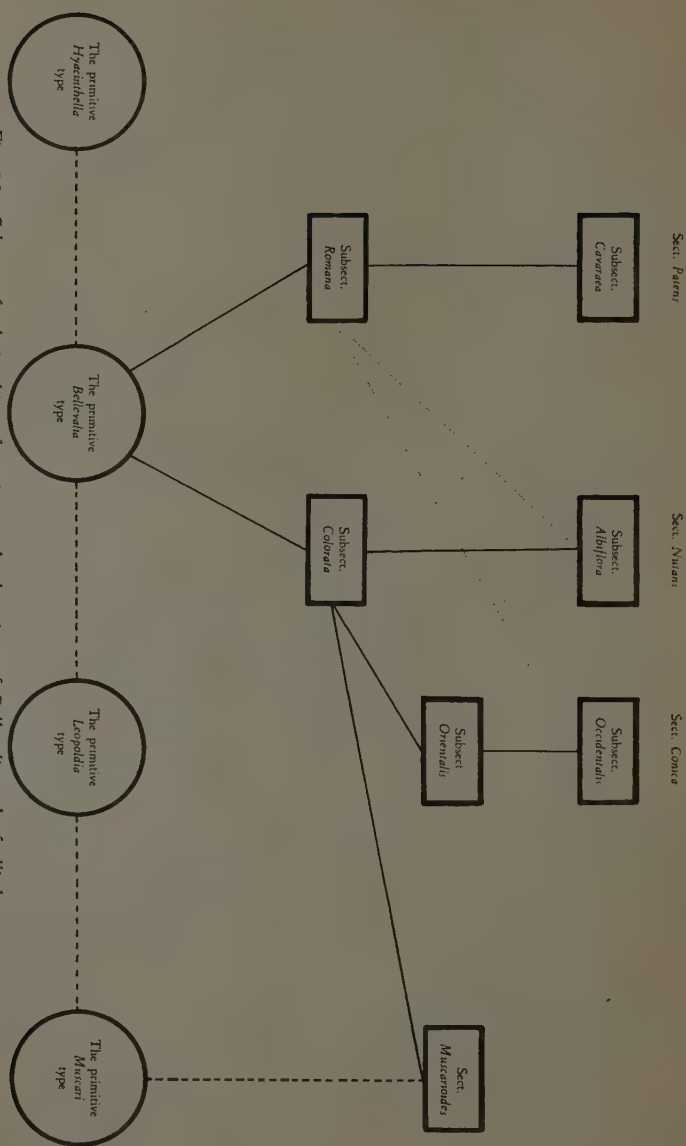


Fig. 36. Scheme of relationships of sections and subsections of *Bellevia* and of allied genera.

The problem of the centre of origin of the genus has also to be discussed. We assume that like many other Mesogean genera, *Bellevia* developed first in the area roughly corresponding to the recent Mediterranean region, chiefly to its western part. Here origins may be found of at least its three bigger sections. As evidence, we consider the large and disjunct areas of the Omni-Mediterranean *B. trifoliata* and the West-Mediterranean *B. ciliata* and *B. romana*. From the West, the genus expanded East and North. At that time *B. macrobotrys* probably had a continuous and very large area from Transcaucasia in the East to Algeria in the West.

It is known (WULFF, 1930 b) that during the Pliocene there existed a direct connection between S. Russia and the Mediterranean countries through Dobrogea. At that time *B. sarmatica* probably reached its present area of distribution, which afterwards became isolated from the Mediterranean centre of the genus. At the end of the Pliocene, Crimea was connected with Asia Minor, a connection which was interrupted at the beginning of the Pleistocene. The development of *B. Lipskyi* and perhaps also that of *B. Clusiana* may be referred to that time. *B. Lipskyi*, a species endemic in S. Crimea, there confined to fields, seems to be a relic of the time when there existed a connection between Crimea and Asia Minor. We have mentioned already that more ancient *Bellevia* species are now chiefly confined to secondary and more or less humid habitats.

Later on, a secondary centre of development seems to have originated in Transcaucasia and probably in the adjacent western and southern districts. In Transcaucasia especially, we find a high species number, belonging to sect. *Conica* (subsect. *Orientalis*), or to sect. *Nutans* (subsect. *Colorata*). They usually have small areas and are confined to specialized ecological conditions of various steppical habitats. At about the same time probably, sect. *Patens* underwent an additional development in the East-Mediterranean subregion. As evidence, the East-Mediterranean *B. nivalis* occurring in the Lebanon and in Cyprus may be recorded. The history of connection of this island with the continent is as follows (HOLMBOE 1914). Until the middle of the Pliocene, Cyprus was part of the Aegean continent; during the end of the Pliocene the island separated, but came in connection with Asia Minor and Syria at the beginning of Pleistocene; in the course of the Pleistocene it separated again. It must have been not later than at the beginning of the Pleistocene that *B. nivalis* had developed. The restricted geographical area of the species does not permit of the as-

sumption that the species already existed during the middle of the Pliocene.

The third and newest development centre, chiefly of steppe species, is found in the East-Mediterranean and Mesopotamian subregions. Among these species 4 polyploid species have been found so far.

We thus assume three main development centres of *Bellevaia*: (1) A western (Mediterranean) centre, which probably already existed during the middle of the Pliocene; (2) An eastern, chiefly Iranian centre, dating from Pleistocene; (3) An East-Mediterranean—Mesopotamian centre which originated more or less recently.

Little is known of the genetic processes which may have participated in the development of *Bellevaia*. Isolation was the probable cause of development of the vicarious forms, such as *B. variabilis*, *B. dubia* ssp. *Hackeli*, *B. macrobotrys* ssp. *Pomelii*. The development of the Iranian centre was also probably due to geographical and ecological isolation, which had taken place in the new habitats, undoubtedly formed in the Pliocene. This process was most probably combined with mutation processes. The allopolyploid species in the third centre of development should have been produced by hybridization between species (and possibly also between sections), combined with duplication of genomes, as in cases known from the genetic literature.

SUMMARY OF THE TAXONOMIC-GEOGRAPHICAL PART

(1) *Bellevaia* is a naturally delimited taxonomic unit of generic rank. It is shown that a complex of diagnostic characters of seed, pod, and flower is peculiar to this group.

(2) The genus is subdivided by the author into four sections: *Nutans*, *Conica*, *Patens*, and *Muscarioides*. The former three are further subdivided into subsections.

(3) The genus comprises 45 species, 12 of which are described for the first time. Caryological and geographical-ecological data are recorded along with morphological characters. An analytical key for the determination of species is provided.

(4) The geographical area of the genus roughly corresponds to the three phytogeographical regions: the Mediterranean, the Irano-Turanian, and the Saharo-Sindian. The distribution of *Bellevaia* species over the various countries of the generic area is shown in Table III. The geographical areas of the species are represented in Plate XX

ABC. The main species concentration is found in the Irano-Turanian region. Geographical relations of the sections and subsections are discussed.

(5) Some general phytogeographical problems are touched. The term Mesogean kingdom is suggested for the combined areas of the three afore-mentioned phytogeographical regions. It may be applied for purposes of floristico-ecological phytogeography only, while the term Tethys region of Eig is reserved for historical phytogeography of the same area.

(6) The origin of the genus is discussed. It is suggested that the genus *Bellevalia* dates from the Pliocene. Some lines of development within the genus are traced, and represented in Fig. 36. Three different development centres are suggested for the genus: The first in the Mediterranean region, the second in the Iranian sub-region, and the third in the contiguous East-Mediterranean and Mesopotamian subregions.

(7) The genetic processes possibly involved in the development of the genus are pointed out.

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SPECIES TO BE EXCLUDED FROM THE GENUS

| | | | |
|---|---|---|-----------|
| <i>B. acutifolia</i> (BOISS.) DELON. | = | <i>Muscari acutifolium</i> BOISS. | |
| <i>B. aleppica</i> BOISS. | = | <i>Hyacinthella nervosa</i> (BERTOL.) | CHOUARD |
| <i>B. aperta</i> GROSSH. | = | <i>Muscari apertum</i> FREYN & CONRATH | |
| <i>B. azurea</i> BOISS. | = | <i>Hyacinthella azurea</i> (FENZL.) | CHOUARD |
| <i>B. Bouriana</i> HELDR. | = | <i>Leopoldia pharmacusana</i> HELDR. | |
| <i>B. bracteosa</i> VELEN. V. | = | <i>Hyacinthella bracteosa</i> (VELEN.) | |
| <i>B. calandriniana</i> NYM. | = | <i>Leopoldia comosa</i> (L.) PARL. (according to Index Kewensis). | |
| <i>B. caucasica</i> GRISEB. | = | <i>Leopoldia caucasica</i> (GRISEB.) LOS. | |
| <i>B. coelestis</i> (FOM.) GROSSH. | = | <i>Muscari coeleste</i> FOM. | |
| <i>B. comosa</i> KTH. | = | <i>Leopoldia comosa</i> (L.) PARL. | |
| <i>B. comosa</i> (C. KOCH) GROSSH. | = | <i>Muscari pycnanthum</i> C. KOCH | |
| <i>B. cupaniana</i> NYM. | = | <i>Leopoldia Cupaniana</i> (GERB. et TAR.) | PARL. |
| <i>B. curta</i> NYM. | = | <i>Leopoldia Holzmanni</i> HELDR. (according to Index Kewensis) | |
| <i>B. elwendia</i> HAUSSK. | = | <i>Muscari elwendium</i> HAUSSK. ? | |
| <i>B. elwendica</i> HAUSSK. et BORN. M. | = | <i>Muscari elwendium</i> HAUSSK. ? | |
| <i>B. Fontanesii</i> NYM. | = | <i>Leopoldia maritima</i> (DESF.) PARL. | |
| <i>B. forniculata</i> (FOM.) DELON. | = | <i>Muscari forniculatum</i> FOM. | |
| <i>B. Freynii</i> F. FOERST. | = | <i>Hyacinthella Freynii</i> (FOERST.) | |
| <i>B. fuliginosa</i> NYM. | = | <i>Muscari fuliginosum</i> FREYN (according to Index Kewensis) | |
| <i>B. graeca</i> HELDR. | = | <i>Leopoldia graeca</i> HELDR. | |
| <i>B. graminifolia</i> NYM. | = | <i>Leopoldia comosa</i> (L.) PARL. | |
| <i>B. Haynei</i> BOISS. | = | <i>Hyacinthella Haynei</i> (BOISS.) ? | |
| | | <i>H. nervosa</i> (BERTOL.) | CHOUARD ? |
| <i>B. Heldreichii</i> BOISS. | = | <i>Hyacinthella Heldreichii</i> (BOISS.) | CHOUARD |
| <i>B. hispida</i> J. GAY | = | <i>Hyacinthella hispida</i> (J. GAY) | |
| <i>B. Holzmannii</i> HELDR. | = | <i>Leopoldia Holzmannii</i> HELDR. | |
| <i>B. leucophaea</i> BOISS. | = | <i>Hyacinthella leucophaea</i> (C. KOCH) | SCHUR. |
| <i>B. lineata</i> KTH. | = | <i>Hyacinthella lineata</i> (STEUD.) | CHOUARD |
| <i>B. macrorrhiza</i> LOJAC. | = | could not be identified | |
| <i>B. maritima</i> KTH. | = | <i>Leopoldia maritima</i> (DESF.) PARL. | |
| <i>B. micrantha</i> BOISS. | = | <i>Hyacinthella micrantha</i> (BOISS.) | CHOUARD |
| <i>B. Müllingeni</i> POST. | = | <i>Hyacinthella nervosa</i> (BERTOL.) | CHOUARD |
| <i>B. monophylla</i> J. GAY | = | <i>Muscari latifolium</i> KIRK. | |
| <i>B. muscarioides</i> MAST. | = | <i>Muscari latifolium</i> KIRK. | |
| <i>B. nervosa</i> BOISS. | = | <i>Hyacinthella nervosa</i> (BERTOL.) | CHOUARD |
| <i>B. pallens</i> VIV. | = | <i>Hyacinthella pallens</i> (VIV.) | |
| <i>B. paradoxa</i> BOISS. | = | <i>Muscari paradoxum</i> (F. et M.) BAK. | |

| | | |
|--|---|--|
| <i>B. paradoxa</i> GROSSH. | = | Muscari paradoxum (F. et M.) BAK. |
| <i>B. persica</i> (BOISS. et BUHSE) BOISS. | = | Hyacinthella persica (BOISS. et BUHSE) CHOUARD |
| <i>B. pharmacusana</i> NYM. | = | Leopoldia pharmacusana HELDR. |
| <i>B. Pinardi</i> BOISS. | = | Leopoldia Pinardi (BOISS.) HELDR. |
| <i>B. pseudomuscari</i> BOISS. et BUHSE | = | Muscari paradoxum (F. et M.) BAK. |
| <i>B. pycnantha</i> (C. KOCH) LOS. | = | Muscari pycnanthum C. KOCH. |
| <i>B. sartoriana</i> NYM. | = | Leopoldia sartoriana HELDR. |
| <i>B. silvestris</i> PORTA | = | could not be identified |
| <i>B. spicata</i> s. et s. | = | Strangweia spicata (s. et s.) BOISS. |
| <i>B. tabriziana</i> TURILL | = | Hyacinthella tabriziana (TURRILL). |
| <i>B. tenuiflora</i> NYM. | = | Leopoldia tenuiflora (TAUSCH.) HELDR. |
| <i>B. theraea</i> NYM. | = | Leopoldia theraea HELDR. |
| <i>B. tristis</i> BORNM. | = | Hyacinthella tristis (BORNM.)? |
| <i>B. Turkewiczii</i> (WOR.) GROSSH. | = | Muscari Turkewiczii (WOR.) LOS. |
| <i>B. Weissii</i> FREYN | = | Leopoldia Weissii FREYN. |

ABBREVIATIONS

HERBARIA :

| | |
|-----------------|---|
| HB | Boissier Herbarium, Geneva. |
| HB _r | Herbarium, University of Brno. |
| HD | Delessert Herbarium, Geneva. |
| HDi | Dinsmore Herbarium, Jerusalem. |
| HF | Herbarium, University of Firenze. |
| HG | Herbarium, University of Graz. |
| HJ | Herbarium, University of Jerusalem. |
| HL | Herbarium, Botanical Garden of Leningrad. |
| HLi | Herbarium, University of Liège. |
| HP | Herbarium, German University of Prague. |
| HPa | Herbarium, Museum of Natural History, Paris. |
| HR | Herbarium, University of Rome. |
| HT | Herbarium, University of Tartu. |
| HV | Herbarium, Museum of Natural History, Vienna. |

COLLECTORS :

E Eig ; F Feinbrun ; Z Zohary.

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- Subsect. Occidentalis FEINBR. 337, 367, 368.
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- alexandrina FEINBR. sp. n. 355, 356, 357.
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- decolorans* BORNHM. 381.
- densiflora* BOISS. 377, 378, 380, 381, 382.
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NOTES

THE EFFECT OF HETERO-AUXIN ON THE GERMINATION OF SOME SEEDS¹

By N. LANDAU

(With 3 diagrams in the text)

All research thus far undertaken has shown, that growth substances have either no influence whatever, or an inhibitory effect upon germination. VEH and SOEDING (1937) conclude: "Alle Beobachtungen zeigen klar, dass der Wuchsstoff fuer die eigentliche Keimung, den Uebergang von Ruhe zum Wachstum, nicht entscheidend ist. Der Wuchsstoff spielt bei den Obstbaum-Kernen nicht die Rolle eines 'Keimungshormons'. Die Keimung der Obstbaumkerne ist kein unmittelbares Wuchsstoffproblem". In our experiments carried out on some cereals and vegetables we found out, that Hetero-Auxin has a direct effect not only upon growth following germination, but on germination itself. This corresponds with the results of some experiments carried out in our laboratory two years ago by E. KONIS, who has shown, that Hetero-Auxin stimulates the germination of wheat seeds.

Shortly after the completion of my experiments, U. RUGE (1939), working on the pure variety of "Hohenheimer Weissshafer" found, that all dilutions of Hetero-Auxin exerted an inhibitory effect, the inhibition decreasing with increasing dilution. However, our experiments on oats have shown, that Hetero-Auxin in certain optimal concentrations has a stimulative effect. We are inclined to assume, that the difference in results obtained, is based on the different reaction of unlike varieties."

¹ Received for publication May, 1939.

² Oat seeds we worked on, have not been genetically pure selected.

This assumption is strengthened by the different effects, obtained on two different varieties of French beans.

METHOD

Most experiments were performed in decimal concentrations of Hetero-Auxin, ranging from $1/10,000$ to $1/10,000,000,000$. Water controls were arranged for each experiment. Weighed quantities of Hetero-Auxin were first dissolved in a few drops of 96% alcohol and then diluted in water. The same quantity of alcohol was then added to all dilutions as well as to the water control.

Experiments were carried out on seeds of wheat, oats, French beans, spring and winter radishes, tomatoes and carrots. In the case of the last four plants, experiments were also conducted on seeds of different ages (1936, 1937).

CONCLUSIONS

Results of the principal experiments are tabulated on the end of this paper. Experiments on oats (Diagram 1) indicate, that Hetero-Auxin, though having an inhibitory influence at a concentration of 10^{-4} exerts a stimulative effect at higher dilutions. The stimulative action attains its maximum at 10^{-7} and 10^{-9} . A point worthy of notice is that in all experiments performed, an inhibitory effect was observable in concentrations of 10^{-8} . In general equal effects, whether stimulative or inhibitory, are obtained in sand at higher concentrations

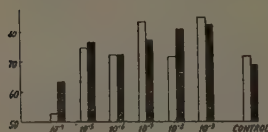


Diagram 1. Average percentage of germination of oats in different solutions of Hetero-Auxin and in water control. Germination in Petri dishes on filter paper. (White columns — germination in light, black columns — germination in dark.)

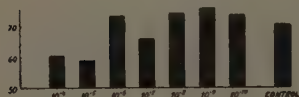


Diagram 2. Average percentage of germination of oats in different solutions of Hetero-Auxin and in water control. Germination in sand.

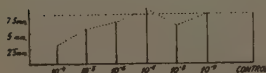


Diagram 3. Average length of coleoptiles of wheat seedlings at the second day of germination in different solutions of Hetero-Auxin and in water control.

than in Petri dishes, and it is easily seen, that the two curves are superposable, if they be suitably shifted towards each other. (Diagram 2).

The same results have been found with one of the two varieties of French beans.

The characteristic maxima with the minimum at 10^{-8} are somehow correlated with the effect of light. Experiments in the dark failed to reveal any such points, a normally rising curve or a typical optimum curve having been obtained.

Measurements of average length of coleoptiles of wheat seedlings in the above mentioned solutions yield a diagram analogous to Diagram 1 (see Diagram 3).

Experiments with seeds of different age (1936 and 1937) of spring and winter radishes, tomatoes and carrots lead us to following conclusions:

The germination of 1937 radish and tomato seeds in Hetero-Auxin solutions and in presence of light is considerably stimulated. In the dark, however, no distinct results have been obtained. Curiously enough

TABLE

Average percentage of germination in different solutions of Hetero-Auxin and in water control. Results of principal experiments.
(Figures in parantheses indicate germination in the dark.)

| | -4
10 | -5
10 | -6
10 | -7
10 | -8
10 | -9
10 | -10
10 | Water
control |
|----------------------|----------|----------|----------|----------|----------|----------|-----------|------------------|
| Oats in Petri dishes | | | | | | | | |
| on filter paper | 53(64) | 75(77) | 73(73) | 84(78) | 72(81) | 85(83) | | 72(69) |
| Oats in sand | 61 | 59 | 74 | 66 | 75 | 76 | 74 | 71 |
| White French bean | | | | | | | | |
| in Petri dishes | 13(5) | 30(26) | 28(34) | 35(35) | 28(34) | 31(29) | | 24(22) |
| White French bean | | | | | | | | |
| in sand | 43 | 24 | 44 | 37 | 43 | 43 | | 39 |
| Speckled yellow | | | | | | | | |
| French bean in | | | | | | | | |
| Petri dishes | 33(19) | 29(23) | 33(31) | 34(18) | 28(22) | 18(21) | 22(20) | 25(22) |
| spring radish 1936 | 1(12) | 3(15) | 10(15) | 8(18) | 9(20) | 8(24) | | 15(14) |
| spring radish 1937 | 28(74) | 28(74) | 48(74) | 58(79) | 56(68) | 64(—) | 51(86) | 53(85) |
| winter radish 1936 | 15(44) | 21(44) | 18(54) | 23(44) | 19(49) | 18(57) | 38(53) | 22(48) |
| winter radish 1937 | 17(45) | 30(41) | 17(43) | 40(46) | 41(46) | 39(44) | 47(43) | 48(45) |
| Tomato 1936 | 39(39) | 37(36) | 43(40) | 38(42) | 39(37) | 45(41) | 12(38) | 43(32) |
| Tomato 1937 | 60(41) | 62(37) | 62(43) | 63(48) | 63(38) | 60(39) | —(37) | 55(35) |
| Carrot 1936 | 0 | 3 | 1 | 0 | 0 | 0 | 1 | 1 |
| Carrot 1937 | 51 | 65 | 49 | 76 | 81 | 77 | 64 | 84 |

on 1936 seeds, Hetero-Auxin was stimulative in the dark, different plants reacting in light differently.

As the quantity of seeds of different ages at our disposal was limited, we were unable to perform a sufficient number of control experiments. It would be desirable to examine these conclusions using greater quantities of experimental material.

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ON THE "GHADA"-TREE OF NORTHERN ARABIA AND THE SYRIAN DESERT

By M. ZOHARY

A botanist perusing the literature of the last century on explorations in Northern Arabia and the Southern Syrian Desert will be disappointed at the almost complete neglect of botany on the part of the explorers. Thus many of the more inaccessible parts of these countries, which have been repeatedly visited by famous students of Arabia have remained vegetationally terra incognita. In reality botanical investigations in these regions were begun only in the last decade. Though made only in some of the central and southern parts of the Syrian Desert, these investigations contribute greatly also to our knowledge of the vegetation of N. Arabia.

In a series of papers and reports dealing with explorations in Arabia and the neighbourhood the "ghada" tree is frequently mentioned. Among the authorities who make mention of this plant are: BLUNT (1881), EUTING (1896-1914), MUSIL (1927), PHILBY (1922), CARPENTHERS (1935), CHEESMAN (1926), LESCH (1930). These authorities occasionally write of the "ghada" tree as being of economic importance among the Beduins of this country. Some papers include detailed descriptions of it as well as drawings or photographs. Some students transcribe its Arabic name as "ghadha", others as "ghada" or "gada" or "gadha" or "raza" but nowhere is the scientific designation of this plant to be found. PELGRAVE (1868), for instance writes: "On the 27th of the month we passed with some difficulty a series of abrupt sand hills that close in the direct course of Wadi Sirhan. Here for the first time we saw the "ghada", a shrub almost characteristic from its very frequency of the Arabian peninsula and often alluded to by its poets. It is of the genus *Euphorbia* (!) with a woody stem often 5-6 feet in height and innumerable round green twigs very slender and flexible, etc. . . it affords some kind of shelter to the traveller and food to his camels". (p. 24-25).

A similar identification is found in EUTING (1896-1914). CHEESMAN identifies his "gadha" with *Arthrocnemum fruticosum* Moq., but this also is incorrect as may be seen by the description and photographs. In PHILBY (1922) its botanical name is *Haloxylon articulatum*, but this again is quite incorrect. Even MUSIL who, in his "Arabia Petraea" de-

votes special attention to this plant and who records botanical identifications¹ of most of the Arabic plant names mentioned in his works failed to identify his "raza" plant botanically. In SCHWEINFURTH's work (1912) I did not find this name at all. LOEW (1924-34) likewise does not identify this name scientifically.

The first botanist who collected the "ghada" in this region was A. AARONSOHN. But he considered it erroneously as *Ephedra alata*. H. OPPENHEIMER (1930), who revised the Herbarium of AARONSOHN identified AARONSOHN's specimens* as *Haloxylon Ammodendron*. It is mentioned under this name in the Reliquiae Aaronsohnianae, as a new plant for the region of POST's Flora. AARONSOHN collected this plant in Ghor es Safie (SE and of the Dead Sea), and in Ghor el Feifeh (N of Wadi 'Araba).

In the years 1929 and 1936 we had the opportunity to collect in the SE border of the Syrian Desert (between Quweira and 'Aqaba) specimens of a tree which clearly belongs to *Haloxylon persicum* Bge. According to the descriptions or photographs recorded by students of Arabia on this subject there is no doubt that the "ghada" tree in question is quite identical with the specimens observed and collected by us, namely with *H. persicum*. Moreover, there is also reason to believe that the "ghada" of AARONSOHN is likewise *H. persicum* and not *H. Ammodendron*.

HABITAT AND DISTRIBUTION

The districts to which *H. persicum* is confined in the Syrian Desert and Northern Arabia constitute a part of the Saharo-Sindian region. This district, though extremely poor in plants and monotonous in landscape, exhibits a series of well-defined plant communities such as: *Artemisietum judaicae*, *Haloxylonetum salicornici*, *Haloxylonetum persici*, *Anabasetum articulati*, *Rhanterietum epapposi*, *Retametum Roetami*, etc. A common feature of all these plant communities is the low degree of covering, the paucity of species and the almost complete absence of arboreal associates. But there are also considerable tracts which are completely destitute of any vegetational covering. Climatically, this district has a very short rainy season. In most parts the annual amount of precipitation does not reach 100 mm. (in some of them the annual amount of rain does not even exceed 25 mm.). There is some evidence that in certain parts of this district there is no rain

¹ MUSIL's plants were determined by VELENOVSKY.

whatsoever for periods of several years. The continental character of its climate is accentuated by the extreme temperatures ($+48^{\circ}$, -8°C) peculiar to some parts of the desert.

H. persicum is in general a plant of sandy habitats growing mostly in slight depressions or in wadis. We observed it on coarse sand of weathered granite, in a shallow wadi, as a tree 4-5 m. high, as well as on slopes of sandy dunes (as shrubs 2.50 m. high). According to the data of MUSIL and others it is also clear that this plant appears both as a tree and as a shrub mostly on sand dunes and in dune valleys.

Within the region under review it is very common in the immense sand dune district of the Nefud and Dahama. It is also not uncommon in Edom E of the Hedjaz Railways line in Wadi Sirhan, Wadi 'Araba, South end of the Dead Sea, and in several districts of southern Arabia Deserta (Jauf, Sakaka, etc.). We do not know the exact southern boundary of its distribution area, but it seems to be characteristic also of some parts of the Nejd, especially of the eastern territories (observed by CHEESMAN in NW Jabin). Outside Arabia it is very common in Persia and in some desert countries of Central Asia.

ECONOMIC IMPORTANCE

H. persicum is one of the well known "Saxaul" trees of the Central Asian countries of U.S.S.R. and Persia, and supplies one of the best kinds of fuel. In some deserts of Central Asia it yields up to 50,000 kg. charcoal per ha. Detailed studies of the economic value of the Saxauls were recently given by BRANKE (quoted in Flora URSS, VI, p. 311) and other Russian botanists. Besides, when green, it is very valuable as food for livestock.

The occurrence of *H. persicum* in the Arabian and Syrian Deserts is phytogeographically most interesting. It indicates clearly the affinities between this desert and those of Central Asia. A closer investigation of the areas covered by *Haloxylonetum persici* and the determination of southern limits of distribution of this Saharo-Sindian-Irano-Turanian plant are highly important also in connection with the economic development of these "sterile" deserts of Arabia. As already pointed out, *Haloxylon persicum* is the only tree dominating over thousands of square miles in a region which apparently does not receive more than 25 mm. of rainfall annually and which, excepting *Haloxylonetum* is entirely destitute of arboreal plant communities (except in moist wadis and near water courses).

To sum up, there is no doubt that immense tracts in the Arabian Desert which now lie quite desolate could, with some effort, be turned to good account by means of afforestation or reafforestation of the tree under review.

This will be useful: (1) in creating a tremendous source of precious food material for desert livestock, (2) in supplying highly valuable wood for fuel and charcoal, (3) in checking the extension of mobile sands.

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השפעת ה-Hetero-Auxin על הנביטה

מאת נ. לנדאו

זרעים של שבלת שועל, חטה ושעועית הונבטו בתמיסות שונות של הטרואוקסין, שהוכנו לפי שטה דצימאלית מ- 10^{-4} עד 10^{-10} . הוכח, שבתמיסות מרוכזות מעכב הטרואוקסין את הנביטה, אולם בתמיסות מהולות יותר הוא מזרז אותה. לפי שורת המהולים נתקבלה עקומה אפינית עם שני מקסימה ב- 10^{-7} ו- 10^{-8} וירידה ב- 10^{-8} . כן הוכח ע"י מדידת הארך הבינוני של הנצרים בנבטי חטה, שאותה העקומה אפינית גם לגבי הצמיחה שבאה לאחר הנביטה. אין העליות והירידות האפיניות האלו מופיעות בנביטה בחשך; כנראה קשורות הן בהשפעת האור. בחול נחלשת פעולת ההטרואוקסין לעומת הנבטות בצלחות פטרי על פני גיר פילטר.

נעשו גם נסיונות בזרעים שנתקבלו מיבולים שונים של צנון, צנונית, עגבניה וגזר (1936 ו-1937). כח נביטתם של הזרעים מיבול 1936 היה ירוד במדה נכרת. ע"י תמיסות הטרואוקסין הצלחנו ברוב המקרים להגדיל את אחוז הנביטה של הזרעים מ-1937, כשההנבטות נעשו באור. בחשך לא נתקבלו תוצאות אחידות. לעומת זאת הראו הזרעים מ-1936 הגברת נביטה בחשך דוקא, ובאור הגיבו צמחים שונים באופן שונה.

עץ ה"עדה" של צפון ערב ומדבר סוריה

מאת מ. זהרי

העובר על ספרות המסעות של צפון ערב ומדבר סוריה נפגש לעתים קרובות בשם של עץ ה"עדה" שמחברים רבים מזכירים אותו בתארים את הנוף של חבלי ארץ אלה. אף אחד מהם לא הצליח לזהותו באופן בוטני.

במאמר הזה נתן בפעם הראשונה הזהוי הבוטני הנכון של העץ הזה; הלא זה *Haloxylon persicum* Bge. הנפוץ מאד בחולות של הנפד (בערב הצפונית) והמצוי גם במדה רבה באדום המזרחית ובודי ערבה. עץ זה הוא אחד הקומפוננטים החשובים של יערות ה-*Saxaul* במדינות אסיה המרכזית ובפרס. חשיבותו הכלכלית גדולה מאד (יעור, תפוקת פחמים, מרעה וכו'). בארץ הוא קשור למדבריות קצוניים שאין מדת המשקיעים השנתית עולה בהם על 100 מ"מ. מציאותו בתוך תחומי א"י מעשירה, איפוא, את הסכויים לנצול-מה של שטחי המדבר השוממים בארץ.

ע ת ו ז ל ב ו ט נ י ק ה

אדר ת"ש

סדרת ירושלים

כרך א' חוב' ד'

תוספת להכרת הפטריות של ארץ-ישראל

חלק ב': פטריות הנאדית (Ascomycetes)

מאת ט. רייס

בעבודה זאת נתן מחקר על 44 פטריות הנאדית, מהן 34 מינים טפילים על 118 צמחים פונדקאים. 28 מינים מאלה הנתונים כאן הם חדשים לארץ ושני מינים חדשים למדע.

מחקר מונוגרפי של הסוג *Bellevalia* (קריולוגיה, טכסנומיה, פילוגיניזה)

(סוף)

מאת נעמי פינברון

הסוג מכיל 45 מינים, 12 מהם תוארו כאן בפעם הראשונה. יחד עם הסמנים המורפולוגיים של המינים נתנים סמנים גיאוגרפיים-איכולוגיים וקריולוגיים. נתן מפתח להגדרת המינים.

האריאל הגיאוגרפי של הסוג חופף פחות או יותר על שלשה אזורים פיטוגיאוגרפיים: היס-תיכוני, האירנו-טורני והסהררסינדי. רשימת ארצות התפוצה של כל מין ומין נתנת בטבלא III (עמ' 389, 388). האריאלים של המינים מצוירים בלוח XX (עמ' 392). רב המינים מרוכזים באזור האירנו-טורני.

נדונו בקצרה בעיות פיטוגיאוגרפיות כלליות אחדות, הקשורות בעיקר בתולדות הצמחיה של שלושת האזורים הנ"ל. משום קרבתם הוצע לאחד את שלשת האזורים הפיטוגיאוגרפיים לממלכה ולכנותה בשם מלכת המיזוגיה. המונח הזה הוא מונח של הפיטוגיאוגרפיה הפלוריסטית-איכולוגית. לעומת זאת המונח אזור הטתיס של איג (1938) הוא מונח של הפיטוגיאוגרפיה ההיסטורית ומצין את אותו השטח.

נדונה שאלת התפתחות הסוג. יש להניח שהתהוותו חלה בפליאוקן. כווני ההתפתחות בתוך הסוג ויחסיו לסוגים הקרובים סומנו בסכימה שבצויר 36 (עמ' 398). שלשה היו כנראה מרכזי התפתחות של הסוג. הראשון באזור היס-תיכוני, השני בכנ-האזור האירני והשלישי בשטח הכולל את האזור היס-תיכוני-מזרחי ובכנ-האזור המסופוטמי.

צוינו תהליכים גנטיים אחדים אשר כנראה שחקו תפקיד בהתפתחות הסוג.

תכן של כרך א' חוב ב'

מוקדש לזכרו של פרופ' אלכסנדר איג

עמוד

| | | | | | | | |
|---|-----|-----|-----|-----|-----|--|--|
| א | ... | ... | ... | ... | ... | ... | מהמערכת |
| א | ... | ... | ... | ... | ... | 1895-1938 | אלכסנדר איג |
| ה | ... | ... | ... | ... | ... | א. קוניס וד. צירקין | השמוש בחמרי צמיחה להשרשת צמחים והשבתם. מאת מ. אבן-ארי. |
| ה | ... | ... | ... | ... | ... | מחקר מונוגרפי של הסוג Bellevalia (קרילוגיה, טכסונומיה, גיאוגרפיה). המשך. | |
| ה | ... | ... | ... | ... | ... | מאת נעמי פינברון | |
| ז | ... | ... | ... | ... | ... | מאת ס. רייס | תוספת להכרת הפטריות של ארץ-ישראל. |
| ז | ... | ... | ... | ... | ... | מאת א. איג | מחקר טכסונומי של מיני Anthemis של המזרח הקרוב. |
| ז | ... | ... | ... | ... | ... | מאת מ. זהרי | על מיני ה Plantago של המזרח הקרוב. |
| ז | ... | ... | ... | ... | ... | מאת ג. אורשנסקי | דימורפיות עונתיות בעלים של Ononis Natrrix L. |
| ח | ... | ... | ... | ... | ... | מאת דבורה ירדני | על הדימורפיות של Ononis leiosperma Boiss. var. Tamarae Jard. |
| ח | ... | ... | ... | ... | ... | מאת נעמי פינברון | נתונים חדשים על צמחי תרבות של ארץ-ישראל בתקופת הברונזה הקדומה. |

תכן של כרך א' חוב ג'

עמוד

| | | | | | | |
|---|-----|-----|-----|-----|---------------------|--|
| א | ... | ... | ... | ... | מאת מ. זהרי | להכרת הצמחיה של מדבר סוריה. |
| א | ... | ... | ... | ... | מאת א. איג | על הצומח של חבל הקרקעות הקלות בשפלת החוף של ארץ ישראל. |
| ב | ... | ... | ... | ... | מאת א. איג ומ. זהרי | צמחים חדשים לארץ-ישראל I. |

תכן של כרך א' חוב ד'

עמוד

| | | | | | | |
|---|-----|-----|-----|-----|------------------|--|
| א | ... | ... | ... | ... | מאת ט. רייס | תוספת להכרת הפטריות של ארץ ישראל, חלק ב'. |
| א | ... | ... | ... | ... | מאת נעמי פינברון | מחקר מונוגרפי של הסוג Bellevalia (קרילוגיה, טכסונומיה, גיאוגרפיה). |
| ב | ... | ... | ... | ... | מאת ג. לנדאו | השפעת ההטרואכסין על הנביטה. |
| ב | ... | ... | ... | ... | מאת מ. זהרי | עץ ה"עדה" של צפון ערב ומדבר סוריה. |

עתון לבוטניקה

סדרת ירושלים

תכן של כרך א' חוב' א'

מוקדש לזכרו של פרופ' אוטו ורבורג

עמוד

| | | | | | | | |
|----|-----|-----|-----|--------------------------|-----|-----------|---|
| א | ... | ... | ... | ... | ... | ... | מהמערכת |
| ב | ... | ... | ... | ... | ... | 1859-1938 | אוטו ורבורג |
| ד | ... | ... | ... | מאת א. איג | ... | ... | על החלוקה הפיטוגיאוגרפית של ארץ ישראל. |
| ד | ... | ... | ... | מאת מ. אבן-ארי וא. קוניס | ... | ... | השמוש בחמרי צמיחה להשרשת צמחים והשבחתם I. |
| ה | ... | ... | ... | מאת פ. פרמי וט. רייס | ... | ... | אצות של המצינות החמים בצרת השחר (קליריה). |
| ה | ... | ... | ... | מאת מ. זהרי | ... | ... | להכרת ההתרבות הבגטיבית אצל הגיאופיטים של המזרח הקרוב. |
| ה | ... | ... | ... | מאת מ. זהרי | ... | ... | מחקר מונוגרפי של הסוג Bellevallia (קרילוגיה, טכסיונומיה, גיאוגרפיה |
| ו | ... | ... | ... | ... | ... | ... | מאת נעמי פינברון |
| ז | ... | ... | ... | ... | ... | ... | חקירות בעדשי ארץ-ישראל II. זני העדשה התרבותית |
| ז | ... | ... | ... | ... | ... | ... | בארץ-ישראל. מאת ד. ו. זיצ'ק |
| ז | ... | ... | ... | ... | ... | ... | מבחן קריטי של המינים האורינוטליים של הסוג Picris (ובכללו גם Hagioseris) |
| ז | ... | ... | ... | מאת א. איג | ... | ... | של עשבות האוניברסיטה העברית. |
| ח | ... | ... | ... | מאת א. איג | ... | ... | Stigmatella — סוג חדש ממשפחת Cruciferae. |
| ח | ... | ... | ... | מאת א. איג | ... | ... | Mosheovia — סוג חדש ממשפחת Scrophulariaceae. |
| ח | ... | ... | ... | מאת ג. מושיוב | ... | ... | השפעת המשרה של גרגירי חסה על הנביטה והגדול. |
| ח | ... | ... | ... | ... | ... | ... | העקוב בנביטה וביצירת השרשים הנגרם על ידי הספול בגפרת-נחושת ובטולו של |
| ט | ... | ... | ... | ... | ... | ... | עקוב זה. מאת ג. מושיוב |
| ט | ... | ... | ... | ... | ... | ... | מחזור ההתפתחות של החלדון על Anchusa strigosa Labill. מאת חיה חבלסקה |
| ט | ... | ... | ... | י. גלימצ'ר | ... | ... | הנביטה של דבקון הזית Viscum cruciatum Sieb. מאת |
| יא | ... | ... | ... | מאת א. איג | ... | ... | הגן הבוטני על שם יוסף מונטגיו למפורט. |
| יא | ... | ... | ... | ... | ... | ... | גן שלומית. מאת א. איג |
| יב | ... | ... | ... | ... | ... | 1913-1936 | לזכרו של גרשון מושיוב |

דפוס עזריאל, ירושלים

ע ת ו ז ל ב ו ט נ י ק ה

סדרת ירושלים

יוצא לאור על ידי

חבר העובדים של המחלקה לבוטניקה באוניברסיטה העברית
(המנהל: א. איג)

כרך א

ירושלים

תרצ"ט / ת"ש

ירושלים

ת. ד. 620

עתון לבוטניקה

סדרת ירושלים

עתון לבוטניקה

מופיע בשתי סדרות

א. סדרת ירושלים:

יוצאת לאור ע"י חבר העובדים של המחלקה לבוטניקה באוניברסיטה העברית בירושלים.
(המנהל: ד"ר א. איג). בכל שנה מופיעות 4 חוברות וכל חוברת נושאת עליה את תאריך הופעתה. כל כרך שנתי מכיל מ"ד 300 עד 400 עמודים.

ב. סדרת רחבות:

יוצאת לאור ע"י ת. ר. אופנהימר וי. ריכרט של התחנה לחקר החקלאות, רחבות, א"י.
בכל שנה מופיעות 2 חוברות וכל חוברת נושאת עליה את תאריך הופעתה. כל כרך שנתי מכיל מ"ד 200 עד 250 עמודים.

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במכתבים הנוגעים לענייני המערכת של סדרת ירושלים יש לפנות לד. ה. ויצק, ת. ד. 620, ירושלים—ולענייני המערכת של סדרת רחבות לעורכי „עתון לבוטניקה", ת. ד. 15, רחבות.

•

את דמי החתימה יש לשלם למפרע ע"י שק או המחאת דואר לפי הכתובת: ההנהלה של העתון לבוטניקה, ת. ד. 620, ירושלים. מחיר החתימה הוא:

| |
|--|
| 1,250 לא"י לשנה, בעד שתי הסדרות |
| 0,900 לא"י לשנה, בעד סדרת ירושלים בלבד |
| 0,600 לא"י לשנה, בעד סדרת רחבות בלבד |
| בסכום זה נכללים גם דמי המשלוח. |
| (מחיר חוברת בודדת 0,300 לא"י ושל כפולה 0,600 לא"י) |

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במכתבים עסקיים, בכלל זה הודעה על שנוי כתובת, מודעות וכו' יש לפנות להנהלת העתון לבוטניקה ת. ד. 620, ירושלים.

ע ת ו ז ל ב ו ט נ י ק ה

סדרת ירושלים

יוצא לאור על ידי

חבר העובדים של המחלקה לבוטניקה באוניברסיטה העברית
(המנהל: א. איג)

ת כ נ

עמוד

| | |
|---|--|
| א | תוספת להכרת הפטריות של ארץ ישראל, חלק ב', מאת ט. רייס |
| | מחקר מונוגרפי של הסוג <i>Bellevalia</i> (קריולוגיה, טכסונומיה, גיאוגרפיה). |
| א | מאת נעמי סינברון |
| ב | השפעת ההטרואוסין על הנביטה. מאת נ. לנדאו |
| כ | עץ ה"עדה" של צפון ערב ומדבר סוריה. מאת מ. זהרי |

ירושלים